Lineage Information

I need to provide information about the how observations were processed or models that were used to create the resource being described.

Overview

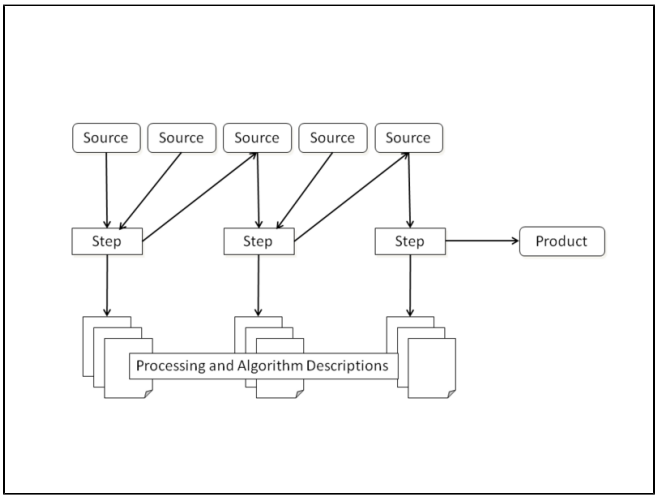
Tracking data sources and processing done to them is becoming increasing important as scientists seek to define trends and unexpected changes in the environment. Keeping track of data transformations and processing, generally termed *lineage*, is an important role of high-quality metadata. The ISO metadata standard provides a simple lineage model based on *sources* which are either used or produced in a series of *process steps*. This model can be helpful in many cases despite its simplicity. Sources and process steps are linked together to describe the lineage of a resource.

Recommendations

1. Describe sources and process steps as separate objects and connect them with XML ids.

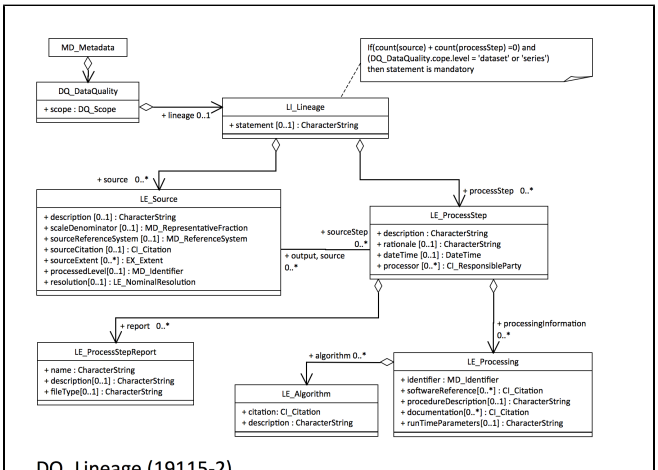
Conceptual Model

The ISO conceptual lineage model describes relationships between two basic types of objects: sources and process steps. This Figure shows an overview how sources and process steps are linked. Sources can be input to, or output (19115-2) from a process step. In this schematic, the first process step has two input sources and one output. That output is combined with the fourth source in the second step to produce the final source which is processed by the final step to create the product. Each process step has associated processing and algorithm information (also added in 19115-2). These improvements make it important to use 19115-2 if you need good lineage descriptions.



The second Figure shows more detail in the UML model used by the ISO Standard to describe lineage. In some cases, a simple descriptive statement can describe the lineage effectively. In more complex cases, multiple sources and process steps might be required. The definitions of sources and processSteps are also shown in the UML. The capability to specify the spatial and temporal extent of the source and to describe the rationale for a process step are new in the ISO Standard. Note that each source can have any number of associated sourceSteps and that each processStep can have any number of sources (and outputs in ISO 19115-2).

Note that ISO 19115-3 separates the lineage information from the data quality information so it appears directly under the MD_DataInformation object.



DQ_Lineage (19115-2)

Implementation (XML)

Implementing these relationships in XML can seem daunting. It is accomplished in the XML representation using ids and references. The LE_Source and LE_ProcessStep objects (the boxes in the UML) are implemented as independent children of the LI_Lineage

object with unique identifiers and the relationships, the source, output, and sourceStep roles in between the boxes, are implemented as references.

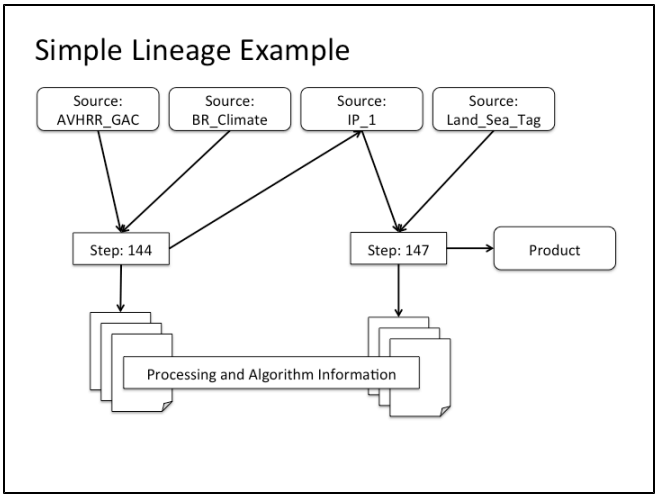
The example shown below shows an illustrative lineage section of a metadata record. The processing includes two processSteps, three external sources, and one intermediate Product. Each source includes

- an id (src_AVHRR_GAC, src_BR_CLIMATE, IP_1 and src_Land_Sea_Tag
- a spatial and temporal extent , and
- a sourceStep which is also defined by a reference to a full definition located in the first part of the lineage section (e.g. xlink:href="#ps_147").

The processing of each source is described in the first part of the lineage section. In this case, the process is the receipt of the the data by the archive. The processSteps include:

- a brief description of the process
- when it was done
- who did it, defined by the processor,
- a reference to the source that was processed (xlink:href ="#src_BR_CLIMATE").

Note the use of id's within this record to identify sources and process steps and to make links between them.




```
<gmd:LI_Lineage xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:gmd="http://www.isotc211.org/2005/gmd"
xmlns:gco="http://www.isotc211.org/2005/gco"
xmlns:xlink="http://www.w3.org/1999/xlink"
xmlns:xs="http://www.w3.org/2001/XMLSchema"
xmlns:srv="http://www.isotc211.org/2005/srv"
xmlns:gml="http://www.opengis.net/gml/3.2"
xmlns:gsr="http://www.isotc211.org/2005/gsr"
    xmlns:gss="http://www.isotc211.org/2005/gss"
xmlns:gts="http://www.isotc211.org/2005/gts"
xmlns:gmx="http://www.isotc211.org/2005/gmx"
xmlns:gmi="http://www.isotc211.org/2005/gmi"
xsi:schemaLocation="http://www.isotc211.org/2005/gmi
http://www.ngdc.noaa.gov/metadata/published/xsd/schema.xsd">
    <gmd:processStep>
        <!--The LE_ProcessStep describes a process step applied to
observations or intermediate products during the creation of the
resource being described.
        It was developed as part of ISO 19115-2 standard and extended
the original LI_ProcessStep from ISO 19115 with the output role and more
details on the algorithms involved in the processing.
        The LE_ProcessStep includes a brief description that is suitable
for display with the metadata, contact information for the organization
responsible for the processing, and-->
        <gmi:LE_ProcessStep id="ps_144">
            <gmd:description>
                <gco:CharacterString>Brief description of the process
step suitable for display along with the metadata.</gco:CharacterString>
            </gmd:description>
            <gmd:dateTime gco:nilReason="Not complete"/>
            <!--The organization (or individual) responsible for the
processStep.-->
```

```
            <gmd:processor>
                <gmd:CI_ResponsibleParty>
                    <!--The name of the organization responsible for the
processStep is usually preferred over an individual name.-->
                    <gmd:organisationName>
                        <gco:CharacterString>The organization
responsible for processing the observations or
model.</gco:CharacterString>
                    </gmd:organisationName>
                    <!--The name of the position in the organization
responsible for the processStep is usually preferred over an individual
name.-->
                    <gmd:positionName>
                        <gco:CharacterString>The name of the position in
the organization responsible for processing the observations or model
(Optional).</gco:CharacterString>
                    </gmd:positionName>
                    <gmd:contactInfo>
                        <gmd:CI_Contact>
                            <gmd:address>
                                <gmd:CI_Address>
                                    <!--The email address is probably
the most effective and persistent contact information.-->
                                    <gmd:electronicMailAddress>
                                        <gco:CharacterString>The
organization responsible for processing the observations or
model.</gco:CharacterString>
                                    </gmd:electronicMailAddress>
                                </gmd:CI_Address>
                            </gmd:address>
                        </gmd:CI_Contact>
                    </gmd:contactInfo>
                    <gmd:role>
                        <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
                        <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.x
ml#CI_RoleCode"
codeListValue="processor">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_Da
```

taQuality/gmd:lineage/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:processor/gmd:CI_ResponsibleParty/gmd:role/gmd:CI_RoleCode</gmd:CI_RoleCode>
                    </gmd:role>
                </gmd:CI_ResponsibleParty>
            </gmd:processor>
            <!--Sources for the processStep are referenced using hrefs and XML ids-->
            <gmd:source xlink:href="#src_AVHRR_GAC"/>
            <!--Sources for the processStep are referenced using hrefs and XML ids-->
            <gmd:source xlink:href="#src_BR_CLIMATE"/>
            <!--Output sources for the processStep are referenced using hrefs and XML ids-->
            <gmi:output xlink:href="#IP_1"/>
        </gmi:LE_ProcessStep>
    </gmd:processStep>
    <gmd:processStep>
        <!--The LE_ProcessStep describes a process step applied to observations or intermediate products during the creation of the resource being described.
        It was developed as part of ISO 19115-2 standard and extended the original LI_ProcessStep from ISO 19115 with the output role and more details on the algorithms involved in the processing.
        The LE_ProcessStep includes a brief description that is suitable for display with the metadata, contact information for the organization responsible for the processing, and-->
        <gmi:LE_ProcessStep id="ps_147">
            <gmd:description>

<gco:CharacterString>/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:lineage/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:description/gco:CharacterString</gco:CharacterString>
            </gmd:description>
            <gmd:dateTime gco:nilReason="Not complete"/>
            <!--The organization (or individual) responsible for the processStep.-->
            <gmd:processor>
                <gmd:CI_ResponsibleParty>
                    <!--The name of the organization responsible for the processStep is usually preferred over an individual name.-->
                    <gmd:organisationName>
                        <gco:CharacterString>The organization responsible for processing the observations or model.</gco:CharacterString>
                    </gmd:organisationName>
                    <!--The name of the position in the organization responsible for the processStep is usually preferred over an individual name.-->
                    <gmd:positionName>
                        <gco:CharacterString>The name of the position in the organization responsible for processing the observations or model (Optional).</gco:CharacterString>

```
                    </gmd:positionName>
                    <gmd:contactInfo>
                        <gmd:CI_Contact>
                            <gmd:address>
                                <gmd:CI_Address>
                                    <!--The email address is probably
the most effective and persistent contact information.-->
                                    <gmd:electronicMailAddress>
                                        <gco:CharacterString>The
organization responsible for processing the observations or
model.</gco:CharacterString>
                                    </gmd:electronicMailAddress>
                                </gmd:CI_Address>
                            </gmd:address>
                        </gmd:CI_Contact>
                    </gmd:contactInfo>
                    <gmd:role>
                        <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
                        <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.x
ml#CI_RoleCode"
codeListValue="processor">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_Da
taQuality/gmd:lineage/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/
gmd:processor/gmd:CI_ResponsibleParty/gmd:role/gmd:CI_RoleCode</gmd:CI_R
oleCode>
                    </gmd:role>
                </gmd:CI_ResponsibleParty>
            </gmd:processor>
            <!--Sources for the processStep are referenced using hrefs
and XML ids-->
            <gmd:source xlink:href="#src_Land_Sea_Tag"/>
            <!--Output sources for the processStep are referenced using
hrefs and XML ids-->
            <gmi:output xlink:href="#IP_1"/>
        </gmi:LE_ProcessStep>
    </gmd:processStep>
    <!--Sources for the processStep are referenced using hrefs and XML
ids-->
```

```
    <gmd:source>
        <gmd:LI_Source id="src_AVHRR_GAC">
            <gmd:description>
                <gco:CharacterString>A brief desctiption of the source
suitable for display along with the metadata.</gco:CharacterString>
            </gmd:description>
            <gmd:sourceCitation>
                <gmd:CI_Citation>
                    <gmd:title>
                        <gco:CharacterString>A title for the
source</gco:CharacterString>
                    </gmd:title>
                    <gmd:date>
                        <gmd:CI_Date>
                            <gmd:date>
                                <gco:Date>2016-11-01</gco:Date>
                            </gmd:date>
                            <gmd:dateType>
                                <!--
        The CI_DateTypeCode is a codelist that the type of a date in the
metadata.
        See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
        It includes two standard attributes: the codelist attribute
gives a URL that gives the location of the codeList,
        and a value from the codelist. The location can be set to the
standard location if the standard codelist is sufficient
        for the data provider needs or, if necessary, it can be set to a
codelist that has been extended to include dataset
        specific values.
        The codeListValue attribute gives the value of the codelist.
This is also the value of the element.
    -->
                                <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.x
ml#CI_DateTypeCode"
codeListValue="publication">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_
DataQuality/gmd:lineage/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sour
ceCitation/gmd:CI_Citation/gmd:date/gmd:CI_Date/gmd:dateType/gmd:CI_Date
TypeCode</gmd:CI_DateTypeCode>
                            </gmd:dateType>
                        </gmd:CI_Date>
                    </gmd:date>
                    <gmd:identifier>
                        <gmd:MD_Identifier>
                            <gmd:code>
                                <gco:CharacterString>A unique identifier
for the source</gco:CharacterString>
                            </gmd:code>
                        </gmd:MD_Identifier>
                    </gmd:identifier>
                    <gmd:citedResponsibleParty>
```

```
                        <gmd:CI_ResponsibleParty>
                            <!--The name of the organization responsible
for the processStep is usually preferred over an individual name.-->
                            <gmd:organisationName>
                                <gco:CharacterString>The organization
responsible for the source.</gco:CharacterString>
                            </gmd:organisationName>
                            <!--The name of the position in the
organization responsible for the processStep is usually preferred over
an individual name.-->
                            <gmd:positionName>
                                <gco:CharacterString>The name of the
position in the organization responsible for the source
(Optional).</gco:CharacterString>
                            </gmd:positionName>
                            <gmd:contactInfo>
                                <gmd:CI_Contact>
                                    <gmd:address>
                                        <gmd:CI_Address>
                                            <!--The email address is
probably the most effective and persistent contact information.-->
                                            <gmd:electronicMailAddress>
                                                <gco:CharacterString>The
organization responsible for the source.</gco:CharacterString>
                                            </gmd:electronicMailAddress>
                                        </gmd:CI_Address>
                                    </gmd:address>
                                </gmd:CI_Contact>
                            </gmd:contactInfo>
                            <gmd:role>
                                <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
                                <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.x
ml#CI_RoleCode"
codeListValue="processor">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_Da
taQuality/gmd:lineage/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/
gmd:processor/gmd:CI_ResponsibleParty/gmd:role/gmd:CI_RoleCode</gmd:CI_R
oleCode>
```

```
                            </gmd:role>
                        </gmd:CI_ResponsibleParty>
                    </gmd:citedResponsibleParty>
                </gmd:CI_Citation>
            </gmd:sourceCitation>
            <gmd:sourceExtent>
                <!--The EX_Extent object is used in many metadata
sections and combines spatial and temporal extent information into a
single object.
    It can include a text description of the extent that could come from
a common source, several kinds of geographic elements, and a vertical
element.-->
                <gmd:EX_Extent>
                    <gmd:description>
                        <gco:CharacterString>A brief desctiption of the
source suitable for display along with the
metadata.</gco:CharacterString>
                    </gmd:description>
                    <gmd:geographicElement>
                        <!--The EX_GeographicBoundingBox includes
bounding latitudes and longitudes (in degrees) for the resource.
    It is the most common type of geographicElement in metadata and
shouls always be provided to support simple spatial searches.-->
                        <gmd:EX_GeographicBoundingBox>
                            <gmd:westBoundLongitude>
                                <gco:Decimal>-180.0</gco:Decimal>
                            </gmd:westBoundLongitude>
                            <gmd:eastBoundLongitude>
                                <gco:Decimal>-180.0</gco:Decimal>
                            </gmd:eastBoundLongitude>
                            <gmd:southBoundLatitude>
                                <gco:Decimal>-90.0</gco:Decimal>
                            </gmd:southBoundLatitude>
                            <gmd:northBoundLatitude>
                                <gco:Decimal>90.0</gco:Decimal>
                            </gmd:northBoundLatitude>
                        </gmd:EX_GeographicBoundingBox>
                    </gmd:geographicElement>
                    <gmd:geographicElement>
                        <!--The GeographicDescription provides an
opportunity to use common names for geographic features to describe the
spatial extent of the resource.
    This could also be the name of an event (e.g. hurricane) associated
with the resource.-->
                        <gmd:EX_GeographicDescription>
                            <gmd:geographicIdentifier>
                                <gmd:MD_Identifier>
                                    <gmd:code>
                                        <gco:CharacterString>A unique
identifier for the extent, i.e. common name for a geographic
region.</gco:CharacterString>
                                    </gmd:code>
                                </gmd:MD_Identifier>
```

```
                            </gmd:geographicIdentifier>
                        </gmd:EX_GeographicDescription>
                    </gmd:geographicElement>
                    <gmd:temporalElement>
                        <!--The EX_TemporalExtent provides a variety of
ways to  to describe the temporal extent of the resource.-->
                        <gmd:EX_TemporalExtent>
                            <gmd:extent>
                                <gml:TimePeriod
gml:id="tp_1114858.37344">

<gml:beginPosition>2000-01-01</gml:beginPosition>
                                      <gml:endPosition
indeterminatePosition="now"/>
                                </gml:TimePeriod>
                            </gmd:extent>
                        </gmd:EX_TemporalExtent>
                    </gmd:temporalElement>
                </gmd:EX_Extent>
            </gmd:sourceExtent>
            <!--ProcesSteps associated with the source are referenced
using hrefs and XML ids-->
            <gmd:sourceStep xlink:href="#ps_144"/>
        </gmd:LI_Source>
    </gmd:source>
    <!--Sources for the processStep are referenced using hrefs and XML
ids-->
    <gmd:source>
        <gmd:LI_Source id="src_Land_Sea_Tag">
            <gmd:description>
                <gco:CharacterString>A brief desctiption of the source
suitable for display along with the metadata.</gco:CharacterString>
            </gmd:description>
            <gmd:sourceCitation>
                <gmd:CI_Citation>
                    <gmd:title>
                        <gco:CharacterString>A title for the
source</gco:CharacterString>
                    </gmd:title>
                    <gmd:date>
                        <gmd:CI_Date>
                            <gmd:date>
                                <gco:Date>2016-11-01</gco:Date>
                            </gmd:date>
                            <gmd:dateType>
                                <!--
        The CI_DateTypeCode is a codelist that the type of a date in the
metadata.
        See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
        It includes two standard attributes: the codelist attribute
gives a URL that gives the location of the codeList,
```

```
        and a value from the codelist. The location can be set to the
standard location if the standard codelist is sufficient
        for the data provider needs or, if necessary, it can be set to a
codelist that has been extended to include dataset
        specific values.
        The codeListValue attribute gives the value of the codelist.
This is also the value of the element.
    -->
                                <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.x
ml#CI_DateTypeCode"
codeListValue="publication">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_
DataQuality/gmd:lineage/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sour
ceCitation/gmd:CI_Citation/gmd:date/gmd:CI_Date/gmd:dateType/gmd:CI_Date
TypeCode</gmd:CI_DateTypeCode>
                            </gmd:dateType>
                        </gmd:CI_Date>
                    </gmd:date>
                    <gmd:identifier>
                        <gmd:MD_Identifier>
                            <gmd:code>
                                <gco:CharacterString>A unique identifier
for the source</gco:CharacterString>
                            </gmd:code>
                        </gmd:MD_Identifier>
                    </gmd:identifier>
                    <gmd:citedResponsibleParty>
                        <gmd:CI_ResponsibleParty>
                            <!--The name of the organization responsible
for the processStep is usually preferred over an individual name.-->
                            <gmd:organisationName>
                                <gco:CharacterString>The organization
responsible for the source.</gco:CharacterString>
                            </gmd:organisationName>
                            <!--The name of the position in the
organization responsible for the processStep is usually preferred over
an individual name.-->
                            <gmd:positionName>
                                <gco:CharacterString>The name of the
position in the organization responsible for the source
(Optional).</gco:CharacterString>
                            </gmd:positionName>
                            <gmd:contactInfo>
                                <gmd:CI_Contact>
                                    <gmd:address>
                                        <gmd:CI_Address>
                                            <!--The email address is
probably the most effective and persistent contact information.-->
                                            <gmd:electronicMailAddress>
                                                <gco:CharacterString>The
organization responsible for the source.</gco:CharacterString>
                                            </gmd:electronicMailAddress>
                                        </gmd:CI_Address>
```

```
                                    </gmd:address>
                                </gmd:CI_Contact>
                            </gmd:contactInfo>
                            <gmd:role>
                                <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
                                <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.x
ml#CI_RoleCode"
codeListValue="processor">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_Da
taQuality/gmd:lineage/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/
gmd:processor/gmd:CI_ResponsibleParty/gmd:role/gmd:CI_RoleCode</gmd:CI_R
oleCode>
                            </gmd:role>
                        </gmd:CI_ResponsibleParty>
                    </gmd:citedResponsibleParty>
                </gmd:CI_Citation>
            </gmd:sourceCitation>
            <gmd:sourceExtent>
                <!--The EX_Extent object is used in many metadata
sections and combines spatial and temporal extent information into a
single object.
    It can include a text description of the extent that could come from
a common source, several kinds of geographic elements, and a vertical
element.-->
                <gmd:EX_Extent>
                    <gmd:description>
                        <gco:CharacterString>A brief desctiption of the
source suitable for display along with the
metadata.</gco:CharacterString>
                    </gmd:description>
                    <gmd:geographicElement>
                        <!--The EX_GeographicBoundingBox includes
bounding latitudes and longitudes (in degrees) for the resource.
    It is the most common type of geographicElement in metadata and
shouls always be provided to support simple spatial searches.-->
                        <gmd:EX_GeographicBoundingBox>
                            <gmd:westBoundLongitude>
                                <gco:Decimal>-180.0</gco:Decimal>
```

```
                            </gmd:westBoundLongitude>
                            <gmd:eastBoundLongitude>
                                <gco:Decimal>-180.0</gco:Decimal>
                            </gmd:eastBoundLongitude>
                            <gmd:southBoundLatitude>
                                <gco:Decimal>-90.0</gco:Decimal>
                            </gmd:southBoundLatitude>
                            <gmd:northBoundLatitude>
                                <gco:Decimal>90.0</gco:Decimal>
                            </gmd:northBoundLatitude>
                        </gmd:EX_GeographicBoundingBox>
                    </gmd:geographicElement>
                    <gmd:geographicElement>
                        <!--The GeographicDescription provides an
opportunity to use common names for geographic features to describe the
spatial extent of the resource.
    This could also be the name of an event (e.g. hurricane) associated
with the resource.-->
                        <gmd:EX_GeographicDescription>
                            <gmd:geographicIdentifier>
                                <gmd:MD_Identifier>
                                    <gmd:code>
                                        <gco:CharacterString>A unique
identifier for the extent, i.e. common name for a geographic
region.</gco:CharacterString>
                                    </gmd:code>
                                </gmd:MD_Identifier>
                            </gmd:geographicIdentifier>
                        </gmd:EX_GeographicDescription>
                    </gmd:geographicElement>
                    <gmd:temporalElement>
                        <!--The EX_TemporalExtent provides a variety of
ways to  to describe the temporal extent of the resource.-->
                        <gmd:EX_TemporalExtent>
                            <gmd:extent>
                                <gml:TimePeriod
gml:id="tp_1114858.3734">

<gml:beginPosition>2000-01-01</gml:beginPosition>
                                    <gml:endPosition
indeterminatePosition="now"/>
                                </gml:TimePeriod>
                            </gmd:extent>
                        </gmd:EX_TemporalExtent>
                    </gmd:temporalElement>
                </gmd:EX_Extent>
            </gmd:sourceExtent>
            <!--ProcesSteps associated with the source are referenced
using hrefs and XML ids-->
            <gmd:sourceStep xlink:href="#ps_147"/>
        </gmd:LI_Source>
    </gmd:source>
    <!--Sources for the processStep are referenced using hrefs and XML
```

ids-->
    <gmd:source>
        <gmd:LI_Source id="src_BR_CLIMATE">
            <gmd:description>

<gco:CharacterString>/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQua
lity/gmd:lineage/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:description
/gco:CharacterString</gco:CharacterString>
            </gmd:description>
            <gmd:sourceCitation>
                <gmd:CI_Citation>
                    <gmd:title>

<gco:CharacterString>/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQua
lity/gmd:lineage/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sourceCitat
ion/gmd:CI_Citation/gmd:title/gco:CharacterString</gco:CharacterString>
                    </gmd:title>
                    <gmd:date>
                        <gmd:CI_Date>
                            <gmd:date gco:nilReason="unknown"/>
                            <gmd:dateType>
                                <!--
        The CI_DateTypeCode is a codelist that the type of a date in the
metadata.
        See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
        It includes two standard attributes: the codelist attribute
gives a URL that gives the location of the codeList,
        and a value from the codelist. The location can be set to the
standard location if the standard codelist is sufficient
        for the data provider needs or, if necessary, it can be set to a
codelist that has been extended to include dataset
        specific values.
        The codeListValue attribute gives the value of the codelist.
This is also the value of the element.
    -->
                                <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.x
ml#CI_DateTypeCode"
codeListValue="publication">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_
DataQuality/gmd:lineage/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sour
ceCitation/gmd:CI_Citation/gmd:date/gmd:CI_Date/gmd:dateType/gmd:CI_Date
TypeCode</gmd:CI_DateTypeCode>
                            </gmd:dateType>
                        </gmd:CI_Date>
                    </gmd:date>
                    <gmd:identifier>
                        <gmd:MD_Identifier>
                            <gmd:code>

<gco:CharacterString>/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQua
lity/gmd:lineage/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sourceCitat

```
ion/gmd:CI_Citation/gmd:identifier/gmd:MD_Identifier/gmd:code/gco:Charac
terString</gco:CharacterString>
                            </gmd:code>
                        </gmd:MD_Identifier>
                    </gmd:identifier>
                    <gmd:citedResponsibleParty>
                        <gmd:CI_ResponsibleParty>
                            <!--The name of the organization responsible
for the processStep is usually preferred over an individual name.-->
                            <gmd:organisationName>
                                <gco:CharacterString>The organization
responsible for the source.</gco:CharacterString>
                            </gmd:organisationName>
                            <!--The name of the position in the
organization responsible for the processStep is usually preferred over
an individual name.-->
                            <gmd:positionName>
                                <gco:CharacterString>The name of the
position in the organization responsible for the source
(Optional).</gco:CharacterString>
                            </gmd:positionName>
                            <gmd:contactInfo>
                                <gmd:CI_Contact>
                                    <gmd:address>
                                        <gmd:CI_Address>
                                            <!--The email address is
probably the most effective and persistent contact information.-->
                                            <gmd:electronicMailAddress>
                                                <gco:CharacterString>The
organization responsible for the source.</gco:CharacterString>
                                            </gmd:electronicMailAddress>
                                        </gmd:CI_Address>
                                    </gmd:address>
                                </gmd:CI_Contact>
                            </gmd:contactInfo>
                            <gmd:role>
                                <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
                                <gmd:CI_RoleCode
```

codeList="codeListLocation#CI_RoleCode"
codeListValue="processor">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:lineage/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:processor/gmd:CI_ResponsibleParty/gmd:role/gmd:CI_RoleCode</gmd:CI_RoleCode>
                            </gmd:role>
                        </gmd:CI_ResponsibleParty>
                    </gmd:citedResponsibleParty>
                    <gmd:citedResponsibleParty>
                        <gmd:CI_ResponsibleParty>
                            <!--The name of the organization responsible for the processStep is usually preferred over an individual name.-->
                            <gmd:organisationName>
                                <gco:CharacterString>The organization responsible for the source.</gco:CharacterString>
                            </gmd:organisationName>
                            <!--The name of the position in the organization responsible for the processStep is usually preferred over an individual name.-->
                            <gmd:positionName>
                                <gco:CharacterString>The name of the position in the organization responsible for the source (Optional).</gco:CharacterString>
                            </gmd:positionName>
                            <gmd:contactInfo>
                                <gmd:CI_Contact>
                                    <gmd:address>
                                        <gmd:CI_Address>
                                            <!--The email address is probably the most effective and persistent contact information.-->
                                            <gmd:electronicMailAddress>
                                                <gco:CharacterString>The organization responsible for the source.</gco:CharacterString>
                                            </gmd:electronicMailAddress>
                                        </gmd:CI_Address>
                                    </gmd:address>
                                </gmd:CI_Contact>
                            </gmd:contactInfo>
                            <gmd:role>
                                <!--
                The CI_RoleCode is a codelist that describes the role of a responsibleParty in the metadata.
                See http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html for standard values.
                It includes two standard attributes: the codelist attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the

codelist. This is also the value of the element.
    -->
                                <gmd:CI_RoleCode
codeList="codeListLocation#CI_RoleCode"
codeListValue="processor">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_Da
taQuality/gmd:lineage/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/
gmd:processor/gmd:CI_ResponsibleParty/gmd:role/gmd:CI_RoleCode</gmd:CI_R
oleCode>
                            </gmd:role>
                        </gmd:CI_ResponsibleParty>
                    </gmd:citedResponsibleParty>
                    <gmd:citedResponsibleParty>
                        <gmd:CI_ResponsibleParty>
                            <!--The name of the organization responsible
for the processStep is usually preferred over an individual name.-->
                            <gmd:organisationName>
                                <gco:CharacterString>The organization
responsible for the source.</gco:CharacterString>
                            </gmd:organisationName>
                            <!--The name of the position in the
organization responsible for the processStep is usually preferred over
an individual name.-->
                            <gmd:positionName>
                                <gco:CharacterString>The name of the
position in the organization responsible for the source
(Optional).</gco:CharacterString>
                            </gmd:positionName>
                            <gmd:contactInfo>
                                <gmd:CI_Contact>
                                    <gmd:address>
                                        <gmd:CI_Address>
                                            <!--The email address is
probably the most effective and persistent contact information.-->
                                            <gmd:electronicMailAddress>
                                                <gco:CharacterString>The
organization responsible for the source.</gco:CharacterString>
                                            </gmd:electronicMailAddress>
                                        </gmd:CI_Address>
                                    </gmd:address>
                                </gmd:CI_Contact>
                            </gmd:contactInfo>
                            <gmd:role>
                                <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be

```
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
                                <gmd:CI_RoleCode
codeList="codeListLocation#CI_RoleCode"
codeListValue="processor">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_Da
taQuality/gmd:lineage/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/
gmd:processor/gmd:CI_ResponsibleParty/gmd:role/gmd:CI_RoleCode</gmd:CI_R
oleCode>
                            </gmd:role>
                        </gmd:CI_ResponsibleParty>
                    </gmd:citedResponsibleParty>
                </gmd:CI_Citation>
            </gmd:sourceCitation>
            <gmd:sourceExtent>
                <!--The EX_Extent object is used in many metadata
sections and combines spatial and temporal extent information into a
single object.
    It can include a text description of the extent that could come from
a common source, several kinds of geographic elements, and a vertical
element.-->
                <gmd:EX_Extent>
                    <gmd:description>
                        <gco:CharacterString>A brief desctiption of the
source suitable for display along with the
metadata.</gco:CharacterString>
                    </gmd:description>
                    <gmd:geographicElement>
                        <!--The EX_GeographicBoundingBox includes
bounding latitudes and longitudes (in degrees) for the resource.
    It is the most common type of geographicElement in metadata and
shouls always be provided to support simple spatial searches.-->
                        <gmd:EX_GeographicBoundingBox>
                            <gmd:westBoundLongitude>
                                <gco:Decimal>-180.0</gco:Decimal>
                            </gmd:westBoundLongitude>
                            <gmd:eastBoundLongitude>
                                <gco:Decimal>-180.0</gco:Decimal>
                            </gmd:eastBoundLongitude>
                            <gmd:southBoundLatitude>
                                <gco:Decimal>-90.0</gco:Decimal>
                            </gmd:southBoundLatitude>
                            <gmd:northBoundLatitude>
                                <gco:Decimal>90.0</gco:Decimal>
                            </gmd:northBoundLatitude>
                        </gmd:EX_GeographicBoundingBox>
                    </gmd:geographicElement>
                    <gmd:geographicElement>
                        <!--The GeographicDescription provides an
opportunity to use common names for geographic features to describe the
spatial extent of the resource.
```

```
    This could also be the name of an event (e.g. hurricane) associated
with the resource.-->
                        <gmd:EX_GeographicDescription>
                            <gmd:geographicIdentifier>
                                <gmd:MD_Identifier>
                                    <gmd:code>
                                        <gco:CharacterString>A unique
identifier for the extent, i.e. common name for a geographic
region.</gco:CharacterString>
                                    </gmd:code>
                                </gmd:MD_Identifier>
                            </gmd:geographicIdentifier>
                        </gmd:EX_GeographicDescription>
                    </gmd:geographicElement>
                    <gmd:temporalElement>
                        <!--The EX_TemporalExtent provides a variety of
ways to  to describe the temporal extent of the resource.-->
                        <gmd:EX_TemporalExtent>
                            <gmd:extent>
                                <gml:TimePeriod
gml:id="tp_1114858.3734444">

<gml:beginPosition>2000-01-01</gml:beginPosition>
                                    <gml:endPosition
indeterminatePosition="now"/>
                                </gml:TimePeriod>
                            </gmd:extent>
                        </gmd:EX_TemporalExtent>
                    </gmd:temporalElement>
                </gmd:EX_Extent>
            </gmd:sourceExtent>
            <!--ProcessSteps associated with the source are referenced
using hrefs and XML ids-->
            <gmd:sourceStep xlink:href="#ps_144"/>
        </gmd:LI_Source>
    </gmd:source>
    <!--Sources for the processStep are referenced using hrefs and XML
ids-->
    <gmd:source>
        <gmd:LI_Source id="IP_1">
            <gmd:description>
                <gco:CharacterString>A brief desctiption of the source
suitable for display along with the metadata.</gco:CharacterString>
            </gmd:description>
            <gmd:sourceCitation>
                <gmd:CI_Citation>
                    <gmd:title>
                        <gco:CharacterString>A title for the
source</gco:CharacterString>
                    </gmd:title>
                    <gmd:date>
                        <gmd:CI_Date>
                            <gmd:date>
```

```
                                <gco:Date>2016-11-01</gco:Date>
                            </gmd:date>
                            <gmd:dateType>
                                <!--
        The CI_DateTypeCode is a codelist that the type of a date in the
metadata.
        See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
        It includes two standard attributes: the codelist attribute
gives a URL that gives the location of the codeList,
        and a value from the codelist. The location can be set to the
standard location if the standard codelist is sufficient
        for the data provider needs or, if necessary, it can be set to a
codelist that has been extended to include dataset
        specific values.
        The codeListValue attribute gives the value of the codelist.
This is also the value of the element.
    -->
                                <gmd:CI_DateTypeCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.x
ml#CI_DateTypeCode"
codeListValue="publication">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_
DataQuality/gmd:lineage/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sour
ceCitation/gmd:CI_Citation/gmd:date/gmd:CI_Date/gmd:dateType/gmd:CI_Date
TypeCode</gmd:CI_DateTypeCode>
                            </gmd:dateType>
                        </gmd:CI_Date>
                    </gmd:date>
                    <gmd:identifier>
                        <gmd:MD_Identifier>
                            <gmd:code>
                                <gco:CharacterString>A unique identifier
for the source</gco:CharacterString>
                            </gmd:code>
                        </gmd:MD_Identifier>
                    </gmd:identifier>
                    <gmd:citedResponsibleParty>
                        <gmd:CI_ResponsibleParty>
                            <!--The name of the organization responsible
for the processStep is usually preferred over an individual name.-->
                            <gmd:organisationName>
                                <gco:CharacterString>The organization
responsible for the source.</gco:CharacterString>
                            </gmd:organisationName>
                            <!--The name of the position in the
organization responsible for the processStep is usually preferred over
an individual name.-->
                            <gmd:positionName>
                                <gco:CharacterString>The name of the
position in the organization responsible for the source
(Optional).</gco:CharacterString>
                            </gmd:positionName>
```

```
                            <gmd:contactInfo>
                                <gmd:CI_Contact>
                                    <gmd:address>
                                        <gmd:CI_Address>
                                            <!--The email address is
probably the most effective and persistent contact information.-->
                                            <gmd:electronicMailAddress>
                                                <gco:CharacterString>The
organization responsible for the source.</gco:CharacterString>
                                            </gmd:electronicMailAddress>
                                        </gmd:CI_Address>
                                    </gmd:address>
                                </gmd:CI_Contact>
                            </gmd:contactInfo>
                            <gmd:role>
                                <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
                                <gmd:CI_RoleCode
codeList="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.x
ml#CI_RoleCode"
codeListValue="processor">/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_Da
taQuality/gmd:lineage/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/
gmd:processor/gmd:CI_ResponsibleParty/gmd:role/gmd:CI_RoleCode</gmd:CI_R
oleCode>
                            </gmd:role>
                        </gmd:CI_ResponsibleParty>
                    </gmd:citedResponsibleParty>
                </gmd:CI_Citation>
            </gmd:sourceCitation>
            <gmd:sourceExtent>
                <!--The EX_Extent object is used in many metadata
sections and combines spatial and temporal extent information into a
single object.
    It can include a text description of the extent that could come from
a common source, several kinds of geographic elements, and a vertical
element.-->
                <gmd:EX_Extent>
                    <gmd:description>
                        <gco:CharacterString>A brief desctiption of the
```

```
source suitable for display along with the
metadata.</gco:CharacterString>
                    </gmd:description>
                    <gmd:geographicElement>
                        <!--The EX_GeographicBoundingBox includes
bounding latitudes and longitudes (in degrees) for the resource.
    It is the most common type of geographicElement in metadata and
shouls always be provided to support simple spatial searches.-->
                        <gmd:EX_GeographicBoundingBox>
                            <gmd:westBoundLongitude>
                                <gco:Decimal>-180.0</gco:Decimal>
                            </gmd:westBoundLongitude>
                            <gmd:eastBoundLongitude>
                                <gco:Decimal>-180.0</gco:Decimal>
                            </gmd:eastBoundLongitude>
                            <gmd:southBoundLatitude>
                                <gco:Decimal>-90.0</gco:Decimal>
                            </gmd:southBoundLatitude>
                            <gmd:northBoundLatitude>
                                <gco:Decimal>90.0</gco:Decimal>
                            </gmd:northBoundLatitude>
                        </gmd:EX_GeographicBoundingBox>
                    </gmd:geographicElement>
                    <gmd:geographicElement>
                        <!--The GeographicDescription provides an
opportunity to use common names for geographic features to describe the
spatial extent of the resource.
    This could also be the name of an event (e.g. hurricane) associated
with the resource.-->
                        <gmd:EX_GeographicDescription>
                            <gmd:geographicIdentifier>
                                <gmd:MD_Identifier>
                                    <gmd:code>
                                        <gco:CharacterString>A unique
identifier for the extent, i.e. common name for a geographic
region.</gco:CharacterString>
                                    </gmd:code>
                                </gmd:MD_Identifier>
                            </gmd:geographicIdentifier>
                        </gmd:EX_GeographicDescription>
                    </gmd:geographicElement>
                    <gmd:temporalElement>
                        <!--The EX_TemporalExtent provides a variety of
ways to  to describe the temporal extent of the resource.-->
                        <gmd:EX_TemporalExtent>
                            <gmd:extent>
                                <gml:TimePeriod
gml:id="tp_1114858.37344">

<gml:beginPosition>2000-01-01</gml:beginPosition>
                                    <gml:endPosition
indeterminatePosition="now"/>
                                </gml:TimePeriod>
```

```
                            </gmd:extent>
                        </gmd:EX_TemporalExtent>
                    </gmd:temporalElement>
                </gmd:EX_Extent>
            </gmd:sourceExtent>
            <!--ProcesSteps associated with the source are referenced
using hrefs and XML ids-->
            <gmd:sourceStep xlink:href="#ps_144"/>
            <!--ProcesSteps associated with the source are referenced
using hrefs and XML ids-->
            <gmd:sourceStep xlink:href="#ps_147"/>
        </gmd:LI_Source>
```

```
    </gmd:source>
</gmd:LI_Lineage>
```

Implementation (NcML)

```
<nc:netcdf xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"

xmlns="http://www.unidata.ucar.edu/namespaces/netcdf/ncml-2.2"

xmlns:nc="http://www.unidata.ucar.edu/namespaces/netcdf/ncml-2.2">
   <nc:group name="gmd:LI_Lineage">
      <nc:attribute name="__role" value="metadataRoot"/>
      <nc:attribute name="__type" value="gmd:LI_Lineage"/>
      <nc:attribute name="@xsi:schemaLocation"
                    value="http://www.isotc211.org/2005/gmi
http://www.ngdc.noaa.gov/metadata/published/xsd/schema.xsd"/>
      <!--The LE_ProcessStep describes a process step applied to
observations or intermediate products during the creation of the
resource being described.
        It was developed as part of ISO 19115-2 standard and extended
the original LI_ProcessStep from ISO 19115 with the output role and more
details on the algorithms involved in the processing.
        The LE_ProcessStep includes a brief description that is suitable
for display with the metadata, contact information for the organization
responsible for the processing, and-->
      <nc:group name="gmd:processStep">
         <nc:attribute name="__role" value="gmd:processStep"/>
         <nc:attribute name="__type" value="gmi:LE_ProcessStep"/>
         <nc:attribute name="@id" value="ps_144"/>
         <nc:attribute name="gmd:description"
                       value="Brief description of the process step
suitable for display along with the metadata."
                       __isoType="gco:CharacterString"/>
         <nc:group name="gmd:dateTime">
            <nc:attribute name="@gco:nilReason" value="Not complete"/>
         </nc:group>
         <!--The organization (or individual) responsible for the
processStep.-->
         <nc:group name="gmd:processor">
            <nc:attribute name="__role" value="gmd:processor"/>
            <nc:attribute name="__type"
value="gmd:CI_ResponsibleParty"/>
            <!--The name of the organization responsible for the
processStep is usually preferred over an individual name.-->
            <nc:attribute name="gmd:organisationName"
                          value="The organization responsible for
processing the observations or model."
                          __isoType="gco:CharacterString"/>
            <!--The name of the position in the organization responsible
```

```
for the processStep is usually preferred over an individual name.-->
            <nc:attribute name="gmd:positionName"
                          value="The name of the position in the
organization responsible for processing the observations or model
(Optional)."
                          __isoType="gco:CharacterString"/>
            <nc:group name="gmd:contactInfo">
               <nc:attribute name="__role" value="gmd:contactInfo"/>
               <nc:attribute name="__type" value="gmd:CI_Contact"/>
               <nc:group name="gmd:address">
                  <nc:attribute name="__role" value="gmd:address"/>
                  <nc:attribute name="__type" value="gmd:CI_Address"/>
                  <!--The email address is probably the most effective
and persistent contact information.-->
                  <nc:attribute name="gmd:electronicMailAddress"
                                value="The organization responsible for
processing the observations or model."
                                __isoType="gco:CharacterString"/>
               </nc:group>
            </nc:group>
            <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
            <nc:group name="gmd:role">
               <nc:attribute name="__role" value="gmd:role"/>
               <nc:attribute name="__type" value="gmd:CI_RoleCode"/>
               <nc:attribute name="@codeList"

value="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#
CI_RoleCode"/>
               <nc:attribute name="@codeListValue" value="processor"/>
               <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:processor/gmd:C
I_ResponsibleParty/gmd:role/gmd:CI_RoleCode"/>
            </nc:group>
         </nc:group>
         <!--Sources for the processStep are referenced using hrefs and
XML ids-->
```

```
         <nc:group name="gmd:source">
            <nc:attribute name="@xlink:href" value="#src_AVHRR_GAC"/>
         </nc:group>
         <!--Sources for the processStep are referenced using hrefs and
XML ids-->
         <nc:group name="gmd:source_d1e35">
            <nc:attribute name="@xlink:href" value="#src_BR_CLIMATE"/>
         </nc:group>
         <!--Output sources for the processStep are referenced using
hrefs and XML ids-->
         <nc:group name="gmi:output">
            <nc:attribute name="@xlink:href" value="#IP_1"/>
         </nc:group>
      </nc:group>
      <!--The LE_ProcessStep describes a process step applied to
observations or intermediate products during the creation of the
resource being described.
        It was developed as part of ISO 19115-2 standard and extended
the original LI_ProcessStep from ISO 19115 with the output role and more
details on the algorithms involved in the processing.
        The LE_ProcessStep includes a brief description that is suitable
for display with the metadata, contact information for the organization
responsible for the processing, and-->
      <nc:group name="gmd:processStep_d1e40">
         <nc:attribute name="__role" value="gmd:processStep"/>
         <nc:attribute name="__type" value="gmi:LE_ProcessStep"/>
         <nc:attribute name="@id" value="ps_147"/>
         <nc:attribute name="gmd:description"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:description/gco
:CharacterString"
                       __isoType="gco:CharacterString"/>
         <nc:group name="gmd:dateTime">
            <nc:attribute name="@gco:nilReason" value="Not complete"/>
         </nc:group>
         <!--The organization (or individual) responsible for the
processStep.-->
         <nc:group name="gmd:processor">
            <nc:attribute name="__role" value="gmd:processor"/>
            <nc:attribute name="__type"
value="gmd:CI_ResponsibleParty"/>
            <!--The name of the organization responsible for the
processStep is usually preferred over an individual name.-->
            <nc:attribute name="gmd:organisationName"
                          value="The organization responsible for
processing the observations or model."
                          __isoType="gco:CharacterString"/>
            <!--The name of the position in the organization responsible
for the processStep is usually preferred over an individual name.-->
            <nc:attribute name="gmd:positionName"
                          value="The name of the position in the
organization responsible for processing the observations or model
```

```
(Optional)."
                          __isoType="gco:CharacterString"/>
            <nc:group name="gmd:contactInfo">
               <nc:attribute name="__role" value="gmd:contactInfo"/>
               <nc:attribute name="__type" value="gmd:CI_Contact"/>
               <nc:group name="gmd:address">
                  <nc:attribute name="__role" value="gmd:address"/>
                  <nc:attribute name="__type" value="gmd:CI_Address"/>
                  <!--The email address is probably the most effective
and persistent contact information.-->
                  <nc:attribute name="gmd:electronicMailAddress"
                                 value="The organization responsible for
processing the observations or model."
                                 __isoType="gco:CharacterString"/>
               </nc:group>
            </nc:group>
            <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
            <nc:group name="gmd:role">
               <nc:attribute name="__role" value="gmd:role"/>
               <nc:attribute name="__type" value="gmd:CI_RoleCode"/>
               <nc:attribute name="@codeList"

value="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#
CI_RoleCode"/>
               <nc:attribute name="@codeListValue" value="processor"/>
               <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:processor/gmd:C
I_ResponsibleParty/gmd:role/gmd:CI_RoleCode"/>
            </nc:group>
         </nc:group>
         <!--Sources for the processStep are referenced using hrefs and
XML ids-->
         <nc:group name="gmd:source">
            <nc:attribute name="@xlink:href" value="#src_Land_Sea_Tag"/>
         </nc:group>
         <!--Output sources for the processStep are referenced using
```

```
hrefs and XML ids-->
         <nc:group name="gmi:output">
            <nc:attribute name="@xlink:href" value="#IP_1"/>
         </nc:group>
      </nc:group>
      <!--Sources for the processStep are referenced using hrefs and XML
ids-->
      <nc:group name="gmd:source">
         <nc:attribute name="__role" value="gmd:source"/>
         <nc:attribute name="__type" value="gmd:LI_Source"/>
         <nc:attribute name="@id" value="src_AVHRR_GAC"/>
         <nc:attribute name="gmd:description"
                       value="A brief desctiption of the source suitable
for display along with the metadata."
                       __isoType="gco:CharacterString"/>
         <nc:group name="gmd:sourceCitation">
            <nc:attribute name="__role" value="gmd:sourceCitation"/>
            <nc:attribute name="__type" value="gmd:CI_Citation"/>
            <nc:attribute name="gmd:title"
                          value="A title for the source"
                          __isoType="gco:CharacterString"/>
            <nc:group name="gmd:date">
               <nc:attribute name="__role" value="gmd:date"/>
               <nc:attribute name="__type" value="gmd:CI_Date"/>
               <nc:attribute name="gmd:date" value="2016-11-01"
__isoType="gco:Date"/>
               <!--
        The CI_DateTypeCode is a codelist that the type of a date in the
metadata.
        See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
        It includes two standard attributes: the codelist attribute
gives a URL that gives the location of the codeList,
        and a value from the codelist. The location can be set to the
standard location if the standard codelist is sufficient
        for the data provider needs or, if necessary, it can be set to a
codelist that has been extended to include dataset
        specific values.
        The codeListValue attribute gives the value of the codelist.
This is also the value of the element.
    -->
               <nc:group name="gmd:dateType">
                  <nc:attribute name="__role" value="gmd:dateType"/>
                  <nc:attribute name="__type"
value="gmd:CI_DateTypeCode"/>
                  <nc:attribute name="@codeList"

value="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#
CI_DateTypeCode"/>
                  <nc:attribute name="@codeListValue"
value="publication"/>
                  <nc:attribute name="value"
```

```
value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sourceCitation/gmd:CI_Cit
ation/gmd:date/gmd:CI_Date/gmd:dateType/gmd:CI_DateTypeCode"/>
               </nc:group>
            </nc:group>
            <nc:group name="gmd:identifier">
               <nc:attribute name="__role" value="gmd:identifier"/>
               <nc:attribute name="__type" value="gmd:MD_Identifier"/>
               <nc:attribute name="gmd:code"
                             value="A unique identifier for the source"
                             __isoType="gco:CharacterString"/>
            </nc:group>
            <nc:group name="gmd:citedResponsibleParty">
               <nc:attribute name="__role"
value="gmd:citedResponsibleParty"/>
               <nc:attribute name="__type"
value="gmd:CI_ResponsibleParty"/>
               <!--The name of the organization responsible for the
processStep is usually preferred over an individual name.-->
               <nc:attribute name="gmd:organisationName"
                             value="The organization responsible for the
source."
                             __isoType="gco:CharacterString"/>
               <!--The name of the position in the organization
responsible for the processStep is usually preferred over an individual
name.-->
               <nc:attribute name="gmd:positionName"
                             value="The name of the position in the
organization responsible for the source (Optional)."
                             __isoType="gco:CharacterString"/>
               <nc:group name="gmd:contactInfo">
                  <nc:attribute name="__role" value="gmd:contactInfo"/>
                  <nc:attribute name="__type" value="gmd:CI_Contact"/>
                  <nc:group name="gmd:address">
                     <nc:attribute name="__role" value="gmd:address"/>
                     <nc:attribute name="__type"
value="gmd:CI_Address"/>
                     <!--The email address is probably the most
effective and persistent contact information.-->
                     <nc:attribute name="gmd:electronicMailAddress"
                                   value="The organization responsible
for the source."
                                   __isoType="gco:CharacterString"/>
                  </nc:group>
               </nc:group>
               <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
```

```
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
              <nc:group name="gmd:role">
                 <nc:attribute name="__role" value="gmd:role"/>
                 <nc:attribute name="__type" value="gmd:CI_RoleCode"/>
                 <nc:attribute name="@codeList"

value="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#
CI_RoleCode"/>
                 <nc:attribute name="@codeListValue"
value="processor"/>
                 <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:processor/gmd:C
I_ResponsibleParty/gmd:role/gmd:CI_RoleCode"/>
              </nc:group>
           </nc:group>
        </nc:group>
        <!--The EX_Extent object is used in many metadata sections and
combines spatial and temporal extent information into a single object.
    It can include a text description of the extent that could come from
a common source, several kinds of geographic elements, and a vertical
element.-->
        <nc:group name="gmd:sourceExtent">
           <nc:attribute name="__role" value="gmd:sourceExtent"/>
           <nc:attribute name="__type" value="gmd:EX_Extent"/>
           <nc:attribute name="gmd:description"
                         value="A brief desctiption of the source
suitable for display along with the metadata."
                         __isoType="gco:CharacterString"/>
           <!--The EX_GeographicBoundingBox includes bounding latitudes
and longitudes (in degrees) for the resource.
    It is the most common type of geographicElement in metadata and
shouls always be provided to support simple spatial searches.-->
           <nc:group name="gmd:geographicElement">
              <nc:attribute name="__role"
value="gmd:geographicElement"/>
              <nc:attribute name="__type"
value="gmd:EX_GeographicBoundingBox"/>
              <nc:attribute name="gmd:westBoundLongitude"
                            value="-180.0"
                            __isoType="gco:Decimal"/>
              <nc:attribute name="gmd:eastBoundLongitude"
                            value="-180.0"
                            __isoType="gco:Decimal"/>
```

```
                <nc:attribute name="gmd:southBoundLatitude" value="-90.0"
__isoType="gco:Decimal"/>
                <nc:attribute name="gmd:northBoundLatitude" value="90.0"
__isoType="gco:Decimal"/>
            </nc:group>
            <!--The GeographicDescription provides an opportunity to use
common names for geographic features to describe the spatial extent of
the resource.
    This could also be the name of an event (e.g. hurricane) associated
with the resource.-->
            <nc:group name="gmd:geographicElement_d1e142">
                <nc:attribute name="__role"
value="gmd:geographicElement"/>
                <nc:attribute name="__type"
value="gmd:EX_GeographicDescription"/>
                <nc:group name="gmd:geographicIdentifier">
                    <nc:attribute name="__role"
value="gmd:geographicIdentifier"/>
                    <nc:attribute name="__type"
value="gmd:MD_Identifier"/>
                    <nc:attribute name="gmd:code"
                                  value="A unique identifier for the
extent, i.e. common name for a geographic region."
                                  __isoType="gco:CharacterString"/>
                </nc:group>
            </nc:group>
            <!--The EX_TemporalExtent provides a variety of ways to  to
describe the temporal extent of the resource.-->
            <nc:group name="gmd:temporalElement">
                <nc:attribute name="__role" value="gmd:temporalElement"/>
                <nc:attribute name="__type"
value="gmd:EX_TemporalExtent"/>
                <nc:group name="gmd:extent">
                    <nc:attribute name="__role" value="gmd:extent"/>
                    <nc:attribute name="__type" value="gml:TimePeriod"/>
                    <nc:attribute name="@gml:id"
value="tp_1114858.37344"/>
                    <nc:attribute name="gml:beginPosition"
                                  value="2000-01-01"
                                  __isoType="gml:attribute"/>
                    <nc:group name="gml:endPosition">
                       <nc:attribute name="@indeterminatePosition"
value="now"/>
                    </nc:group>
                </nc:group>
            </nc:group>
        </nc:group>
        <!--ProcesSteps associated with the source are referenced using
hrefs and XML ids-->
        <nc:group name="gmd:sourceStep">
            <nc:attribute name="@xlink:href" value="#ps_144"/>
        </nc:group>
    </nc:group>
```

```
      <!--Sources for the processStep are referenced using hrefs and XML
ids-->
      <nc:group name="gmd:source_d1e160">
         <nc:attribute name="__role" value="gmd:source"/>
         <nc:attribute name="__type" value="gmd:LI_Source"/>
         <nc:attribute name="@id" value="src_Land_Sea_Tag"/>
         <nc:attribute name="gmd:description"
                       value="A brief desctiption of the source suitable
for display along with the metadata."
                       __isoType="gco:CharacterString"/>
         <nc:group name="gmd:sourceCitation">
            <nc:attribute name="__role" value="gmd:sourceCitation"/>
            <nc:attribute name="__type" value="gmd:CI_Citation"/>
            <nc:attribute name="gmd:title"
                          value="A title for the source"
                          __isoType="gco:CharacterString"/>
            <nc:group name="gmd:date">
               <nc:attribute name="__role" value="gmd:date"/>
               <nc:attribute name="__type" value="gmd:CI_Date"/>
               <nc:attribute name="gmd:date" value="2016-11-01"
__isoType="gco:Date"/>
               <!--
        The CI_DateTypeCode is a codelist that the type of a date in the
metadata.
        See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
        It includes two standard attributes: the codelist attribute
gives a URL that gives the location of the codeList,
        and a value from the codelist. The location can be set to the
standard location if the standard codelist is sufficient
        for the data provider needs or, if necessary, it can be set to a
codelist that has been extended to include dataset
        specific values.
        The codeListValue attribute gives the value of the codelist.
This is also the value of the element.
    -->
               <nc:group name="gmd:dateType">
                  <nc:attribute name="__role" value="gmd:dateType"/>
                  <nc:attribute name="__type"
value="gmd:CI_DateTypeCode"/>
                  <nc:attribute name="@codeList"

value="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#
CI_DateTypeCode"/>
                  <nc:attribute name="@codeListValue"
value="publication"/>
                  <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sourceCitation/gmd:CI_Cit
ation/gmd:date/gmd:CI_Date/gmd:dateType/gmd:CI_DateTypeCode"/>
               </nc:group>
```

```
            </nc:group>
            <nc:group name="gmd:identifier">
               <nc:attribute name="__role" value="gmd:identifier"/>
               <nc:attribute name="__type" value="gmd:MD_Identifier"/>
               <nc:attribute name="gmd:code"
                             value="A unique identifier for the source"
                             __isoType="gco:CharacterString"/>
            </nc:group>
            <nc:group name="gmd:citedResponsibleParty">
               <nc:attribute name="__role"
value="gmd:citedResponsibleParty"/>
               <nc:attribute name="__type"
value="gmd:CI_ResponsibleParty"/>
               <!--The name of the organization responsible for the
processStep is usually preferred over an individual name.-->
               <nc:attribute name="gmd:organisationName"
                             value="The organization responsible for the
source."
                             __isoType="gco:CharacterString"/>
               <!--The name of the position in the organization
responsible for the processStep is usually preferred over an individual
name.-->
               <nc:attribute name="gmd:positionName"
                             value="The name of the position in the
organization responsible for the source (Optional)."
                             __isoType="gco:CharacterString"/>
               <nc:group name="gmd:contactInfo">
                  <nc:attribute name="__role" value="gmd:contactInfo"/>
                  <nc:attribute name="__type" value="gmd:CI_Contact"/>
                  <nc:group name="gmd:address">
                     <nc:attribute name="__role" value="gmd:address"/>
                     <nc:attribute name="__type"
value="gmd:CI_Address"/>
                     <!--The email address is probably the most
effective and persistent contact information.-->
                     <nc:attribute name="gmd:electronicMailAddress"
                                   value="The organization responsible
for the source."
                                   __isoType="gco:CharacterString"/>
                  </nc:group>
               </nc:group>
               <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
```

```
                 specific values.
                 The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
              <nc:group name="gmd:role">
                 <nc:attribute name="__role" value="gmd:role"/>
                 <nc:attribute name="__type" value="gmd:CI_RoleCode"/>
                 <nc:attribute name="@codeList"

value="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#
CI_RoleCode"/>
                 <nc:attribute name="@codeListValue"
value="processor"/>
                 <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:processor/gmd:C
I_ResponsibleParty/gmd:role/gmd:CI_RoleCode"/>
              </nc:group>
           </nc:group>
        </nc:group>
        <!--The EX_Extent object is used in many metadata sections and
combines spatial and temporal extent information into a single object.
    It can include a text description of the extent that could come from
a common source, several kinds of geographic elements, and a vertical
element.-->
        <nc:group name="gmd:sourceExtent">
           <nc:attribute name="__role" value="gmd:sourceExtent"/>
           <nc:attribute name="__type" value="gmd:EX_Extent"/>
           <nc:attribute name="gmd:description"
                         value="A brief desctiption of the source
suitable for display along with the metadata."
                         __isoType="gco:CharacterString"/>
           <!--The EX_GeographicBoundingBox includes bounding latitudes
and longitudes (in degrees) for the resource.
    It is the most common type of geographicElement in metadata and
shouls always be provided to support simple spatial searches.-->
           <nc:group name="gmd:geographicElement">
              <nc:attribute name="__role"
value="gmd:geographicElement"/>
              <nc:attribute name="__type"
value="gmd:EX_GeographicBoundingBox"/>
              <nc:attribute name="gmd:westBoundLongitude"
                            value="-180.0"
                            __isoType="gco:Decimal"/>
              <nc:attribute name="gmd:eastBoundLongitude"
                            value="-180.0"
                            __isoType="gco:Decimal"/>
              <nc:attribute name="gmd:southBoundLatitude" value="-90.0"
__isoType="gco:Decimal"/>
              <nc:attribute name="gmd:northBoundLatitude" value="90.0"
__isoType="gco:Decimal"/>
           </nc:group>
```

```
            <!--The GeographicDescription provides an opportunity to use
common names for geographic features to describe the spatial extent of
the resource.
    This could also be the name of an event (e.g. hurricane) associated
with the resource.-->
            <nc:group name="gmd:geographicElement_d1e228">
               <nc:attribute name="__role"
value="gmd:geographicElement"/>
               <nc:attribute name="__type"
value="gmd:EX_GeographicDescription"/>
               <nc:group name="gmd:geographicIdentifier">
                  <nc:attribute name="__role"
value="gmd:geographicIdentifier"/>
                  <nc:attribute name="__type"
value="gmd:MD_Identifier"/>
                  <nc:attribute name="gmd:code"
                                value="A unique identifier for the
extent, i.e. common name for a geographic region."
                                __isoType="gco:CharacterString"/>
               </nc:group>
            </nc:group>
            <!--The EX_TemporalExtent provides a variety of ways to  to
describe the temporal extent of the resource.-->
            <nc:group name="gmd:temporalElement">
               <nc:attribute name="__role" value="gmd:temporalElement"/>
               <nc:attribute name="__type"
value="gmd:EX_TemporalExtent"/>
               <nc:group name="gmd:extent">
                  <nc:attribute name="__role" value="gmd:extent"/>
                  <nc:attribute name="__type" value="gml:TimePeriod"/>
                  <nc:attribute name="@gml:id" value="tp_1114858.3734"/>
                  <nc:attribute name="gml:beginPosition"
                                value="2000-01-01"
                                __isoType="gml:attribute"/>
                  <nc:group name="gml:endPosition">
                     <nc:attribute name="@indeterminatePosition"
value="now"/>
                  </nc:group>
               </nc:group>
            </nc:group>
         </nc:group>
         <!--ProcessSteps associated with the source are referenced using
hrefs and XML ids-->
         <nc:group name="gmd:sourceStep">
            <nc:attribute name="@xlink:href" value="#ps_147"/>
         </nc:group>
      </nc:group>
      <!--Sources for the processStep are referenced using hrefs and XML
ids-->
      <nc:group name="gmd:source_d1e246">
         <nc:attribute name="__role" value="gmd:source"/>
         <nc:attribute name="__type" value="gmd:LI_Source"/>
         <nc:attribute name="@id" value="src_BR_CLIMATE"/>
```

```
         <nc:attribute name="gmd:description"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:description/gco:Character
String"
                       __isoType="gco:CharacterString"/>
         <nc:group name="gmd:sourceCitation">
            <nc:attribute name="__role" value="gmd:sourceCitation"/>
            <nc:attribute name="__type" value="gmd:CI_Citation"/>
            <nc:attribute name="gmd:title"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sourceCitation/gmd:CI_Cit
ation/gmd:title/gco:CharacterString"
                          __isoType="gco:CharacterString"/>
            <nc:group name="gmd:date">
               <nc:attribute name="__role" value="gmd:date"/>
               <nc:attribute name="__type" value="gmd:CI_Date"/>
               <nc:group name="gmd:date">
                  <nc:attribute name="@gco:nilReason" value="unknown"/>
               </nc:group>
               <!--
        The CI_DateTypeCode is a codelist that the type of a date in the
metadata.
        See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
        It includes two standard attributes: the codelist attribute
gives a URL that gives the location of the codeList,
        and a value from the codelist. The location can be set to the
standard location if the standard codelist is sufficient
        for the data provider needs or, if necessary, it can be set to a
codelist that has been extended to include dataset
        specific values.
        The codeListValue attribute gives the value of the codelist.
This is also the value of the element.
    -->
               <nc:group name="gmd:dateType">
                  <nc:attribute name="__role" value="gmd:dateType"/>
                  <nc:attribute name="__type"
value="gmd:CI_DateTypeCode"/>
                  <nc:attribute name="@codeList"

value="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#
CI_DateTypeCode"/>
                  <nc:attribute name="@codeListValue"
value="publication"/>
                  <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sourceCitation/gmd:CI_Cit
ation/gmd:date/gmd:CI_Date/gmd:dateType/gmd:CI_DateTypeCode"/>
               </nc:group>
```

```
            </nc:group>
            <nc:group name="gmd:identifier">
               <nc:attribute name="__role" value="gmd:identifier"/>
               <nc:attribute name="__type" value="gmd:MD_Identifier"/>
               <nc:attribute name="gmd:code"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sourceCitation/gmd:CI_Cit
ation/gmd:identifier/gmd:MD_Identifier/gmd:code/gco:CharacterString"
                            __isoType="gco:CharacterString"/>
            </nc:group>
            <nc:group name="gmd:citedResponsibleParty">
               <nc:attribute name="__role"
value="gmd:citedResponsibleParty"/>
               <nc:attribute name="__type"
value="gmd:CI_ResponsibleParty"/>
               <!--The name of the organization responsible for the
processStep is usually preferred over an individual name.-->
               <nc:attribute name="gmd:organisationName"
                            value="The organization responsible for the
source."
                            __isoType="gco:CharacterString"/>
               <!--The name of the position in the organization
responsible for the processStep is usually preferred over an individual
name.-->
               <nc:attribute name="gmd:positionName"
                            value="The name of the position in the
organization responsible for the source (Optional)."
                            __isoType="gco:CharacterString"/>
               <nc:group name="gmd:contactInfo">
                  <nc:attribute name="__role" value="gmd:contactInfo"/>
                  <nc:attribute name="__type" value="gmd:CI_Contact"/>
                  <nc:group name="gmd:address">
                     <nc:attribute name="__role" value="gmd:address"/>
                     <nc:attribute name="__type"
value="gmd:CI_Address"/>
                     <!--The email address is probably the most
effective and persistent contact information.-->
                     <nc:attribute name="gmd:electronicMailAddress"
                                   value="The organization responsible
for the source."
                                   __isoType="gco:CharacterString"/>
                  </nc:group>
               </nc:group>
               <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
```

```
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
               <nc:group name="gmd:role">
                  <nc:attribute name="__role" value="gmd:role"/>
                  <nc:attribute name="__type" value="gmd:CI_RoleCode"/>
                  <nc:attribute name="@codeList"
value="codeListLocation#CI_RoleCode"/>
                  <nc:attribute name="@codeListValue"
value="processor"/>
                  <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:processor/gmd:C
I_ResponsibleParty/gmd:role/gmd:CI_RoleCode"/>
               </nc:group>
            </nc:group>
            <nc:group name="gmd:citedResponsibleParty_d1e290">
               <nc:attribute name="__role"
value="gmd:citedResponsibleParty"/>
               <nc:attribute name="__type"
value="gmd:CI_ResponsibleParty"/>
               <!--The name of the organization responsible for the
processStep is usually preferred over an individual name.-->
               <nc:attribute name="gmd:organisationName"
                             value="The organization responsible for the
source."
                             __isoType="gco:CharacterString"/>
               <!--The name of the position in the organization
responsible for the processStep is usually preferred over an individual
name.-->
               <nc:attribute name="gmd:positionName"
                             value="The name of the position in the
organization responsible for the source (Optional)."
                             __isoType="gco:CharacterString"/>
               <nc:group name="gmd:contactInfo">
                  <nc:attribute name="__role" value="gmd:contactInfo"/>
                  <nc:attribute name="__type" value="gmd:CI_Contact"/>
                  <nc:group name="gmd:address">
                     <nc:attribute name="__role" value="gmd:address"/>
                     <nc:attribute name="__type"
value="gmd:CI_Address"/>
                     <!--The email address is probably the most
effective and persistent contact information.-->
                     <nc:attribute name="gmd:electronicMailAddress"
                                   value="The organization responsible
for the source."
                                   __isoType="gco:CharacterString"/>
                  </nc:group>
```

```
                </nc:group>
                <!--
                 The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                 See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                 It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                 and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                 for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                 specific values.
                 The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
                <nc:group name="gmd:role">
                   <nc:attribute name="__role" value="gmd:role"/>
                   <nc:attribute name="__type" value="gmd:CI_RoleCode"/>
                   <nc:attribute name="@codeList"
value="codeListLocation#CI_RoleCode"/>
                   <nc:attribute name="@codeListValue"
value="processor"/>
                   <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:processor/gmd:C
I_ResponsibleParty/gmd:role/gmd:CI_RoleCode"/>
                </nc:group>
             </nc:group>
             <nc:group name="gmd:citedResponsibleParty_d1e312">
                <nc:attribute name="__role"
value="gmd:citedResponsibleParty"/>
                <nc:attribute name="__type"
value="gmd:CI_ResponsibleParty"/>
                <!--The name of the organization responsible for the
processStep is usually preferred over an individual name.-->
                <nc:attribute name="gmd:organisationName"
                              value="The organization responsible for the
source."
                              __isoType="gco:CharacterString"/>
                <!--The name of the position in the organization
responsible for the processStep is usually preferred over an individual
name.-->
                <nc:attribute name="gmd:positionName"
                              value="The name of the position in the
organization responsible for the source (Optional)."
                              __isoType="gco:CharacterString"/>
                <nc:group name="gmd:contactInfo">
                   <nc:attribute name="__role" value="gmd:contactInfo"/>
                   <nc:attribute name="__type" value="gmd:CI_Contact"/>
                   <nc:group name="gmd:address">
```

```
                      <nc:attribute name="__role" value="gmd:address"/>
                      <nc:attribute name="__type"
value="gmd:CI_Address"/>
                      <!--The email address is probably the most
effective and persistent contact information.-->
                      <nc:attribute name="gmd:electronicMailAddress"
                                    value="The organization responsible
for the source."
                                    __isoType="gco:CharacterString"/>
                  </nc:group>
               </nc:group>
               <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
               <nc:group name="gmd:role">
                  <nc:attribute name="__role" value="gmd:role"/>
                  <nc:attribute name="__type" value="gmd:CI_RoleCode"/>
                  <nc:attribute name="@codeList"
value="codeListLocation#CI_RoleCode"/>
                  <nc:attribute name="@codeListValue"
value="processor"/>
                  <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:processor/gmd:C
I_ResponsibleParty/gmd:role/gmd:CI_RoleCode"/>
               </nc:group>
            </nc:group>
         </nc:group>
         <!--The EX_Extent object is used in many metadata sections and
combines spatial and temporal extent information into a single object.
    It can include a text description of the extent that could come from
a common source, several kinds of geographic elements, and a vertical
element.-->
         <nc:group name="gmd:sourceExtent">
            <nc:attribute name="__role" value="gmd:sourceExtent"/>
            <nc:attribute name="__type" value="gmd:EX_Extent"/>
            <nc:attribute name="gmd:description"
                          value="A brief desctiption of the source
suitable for display along with the metadata."
```

```
                          __isoType="gco:CharacterString"/>
            <!--The EX_GeographicBoundingBox includes bounding latitudes
and longitudes (in degrees) for the resource.
    It is the most common type of geographicElement in metadata and
shouls always be provided to support simple spatial searches.-->
            <nc:group name="gmd:geographicElement">
               <nc:attribute name="__role"
value="gmd:geographicElement"/>
               <nc:attribute name="__type"
value="gmd:EX_GeographicBoundingBox"/>
               <nc:attribute name="gmd:westBoundLongitude"
                             value="-180.0"
                             __isoType="gco:Decimal"/>
               <nc:attribute name="gmd:eastBoundLongitude"
                             value="-180.0"
                             __isoType="gco:Decimal"/>
               <nc:attribute name="gmd:southBoundLatitude" value="-90.0"
__isoType="gco:Decimal"/>
               <nc:attribute name="gmd:northBoundLatitude" value="90.0"
__isoType="gco:Decimal"/>
            </nc:group>
            <!--The GeographicDescription provides an opportunity to use
common names for geographic features to describe the spatial extent of
the resource.
    This could also be the name of an event (e.g. hurricane) associated
with the resource.-->
            <nc:group name="gmd:geographicElement_d1e356">
               <nc:attribute name="__role"
value="gmd:geographicElement"/>
               <nc:attribute name="__type"
value="gmd:EX_GeographicDescription"/>
               <nc:group name="gmd:geographicIdentifier">
                  <nc:attribute name="__role"
value="gmd:geographicIdentifier"/>
                  <nc:attribute name="__type"
value="gmd:MD_Identifier"/>
                  <nc:attribute name="gmd:code"
                                value="A unique identifier for the
extent, i.e. common name for a geographic region."
                                __isoType="gco:CharacterString"/>
               </nc:group>
            </nc:group>
            <!--The EX_TemporalExtent provides a variety of ways to  to
describe the temporal extent of the resource.-->
            <nc:group name="gmd:temporalElement">
               <nc:attribute name="__role" value="gmd:temporalElement"/>
               <nc:attribute name="__type"
value="gmd:EX_TemporalExtent"/>
               <nc:group name="gmd:extent">
                  <nc:attribute name="__role" value="gmd:extent"/>
                  <nc:attribute name="__type" value="gml:TimePeriod"/>
                  <nc:attribute name="@gml:id"
value="tp_1114858.3734444"/>
```

```
                  <nc:attribute name="gml:beginPosition"
                                value="2000-01-01"
                                __isoType="gml:attribute"/>
                  <nc:group name="gml:endPosition">
                     <nc:attribute name="@indeterminatePosition"
value="now"/>
                  </nc:group>
               </nc:group>
            </nc:group>
         </nc:group>
         <!--ProcessSteps associated with the source are referenced using
hrefs and XML ids-->
         <nc:group name="gmd:sourceStep">
            <nc:attribute name="@xlink:href" value="#ps_144"/>
         </nc:group>
      </nc:group>
      <!--Sources for the processStep are referenced using hrefs and XML
ids-->
      <nc:group name="gmd:source_d1e374">
         <nc:attribute name="__role" value="gmd:source"/>
         <nc:attribute name="__type" value="gmd:LI_Source"/>
         <nc:attribute name="@id" value="IP_1"/>
         <nc:attribute name="gmd:description"
                       value="A brief desctiption of the source suitable
for display along with the metadata."
                       __isoType="gco:CharacterString"/>
         <nc:group name="gmd:sourceCitation">
            <nc:attribute name="__role" value="gmd:sourceCitation"/>
            <nc:attribute name="__type" value="gmd:CI_Citation"/>
            <nc:attribute name="gmd:title"
                          value="A title for the source"
                          __isoType="gco:CharacterString"/>
            <nc:group name="gmd:date">
               <nc:attribute name="__role" value="gmd:date"/>
               <nc:attribute name="__type" value="gmd:CI_Date"/>
               <nc:attribute name="gmd:date" value="2016-11-01"
__isoType="gco:Date"/>
               <!--
        The CI_DateTypeCode is a codelist that the type of a date in the
metadata.
        See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
        It includes two standard attributes: the codelist attribute
gives a URL that gives the location of the codeList,
        and a value from the codelist. The location can be set to the
standard location if the standard codelist is sufficient
        for the data provider needs or, if necessary, it can be set to a
codelist that has been extended to include dataset
        specific values.
        The codeListValue attribute gives the value of the codelist.
This is also the value of the element.
    -->
```

```
                <nc:group name="gmd:dateType">
                   <nc:attribute name="__role" value="gmd:dateType"/>
                   <nc:attribute name="__type"
value="gmd:CI_DateTypeCode"/>
                   <nc:attribute name="@codeList"

value="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#
CI_DateTypeCode"/>
                   <nc:attribute name="@codeListValue"
value="publication"/>
                   <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:source/gmd:LI_Source/gmd:sourceCitation/gmd:CI_Cit
ation/gmd:date/gmd:CI_Date/gmd:dateType/gmd:CI_DateTypeCode"/>
                </nc:group>
             </nc:group>
             <nc:group name="gmd:identifier">
                <nc:attribute name="__role" value="gmd:identifier"/>
                <nc:attribute name="__type" value="gmd:MD_Identifier"/>
                <nc:attribute name="gmd:code"
                              value="A unique identifier for the source"
                              __isoType="gco:CharacterString"/>
             </nc:group>
             <nc:group name="gmd:citedResponsibleParty">
                <nc:attribute name="__role"
value="gmd:citedResponsibleParty"/>
                <nc:attribute name="__type"
value="gmd:CI_ResponsibleParty"/>
                <!--The name of the organization responsible for the
processStep is usually preferred over an individual name.-->
                <nc:attribute name="gmd:organisationName"
                              value="The organization responsible for the
source."
                              __isoType="gco:CharacterString"/>
                <!--The name of the position in the organization
responsible for the processStep is usually preferred over an individual
name.-->
                <nc:attribute name="gmd:positionName"
                              value="The name of the position in the
organization responsible for the source (Optional)."
                              __isoType="gco:CharacterString"/>
                <nc:group name="gmd:contactInfo">
                   <nc:attribute name="__role" value="gmd:contactInfo"/>
                   <nc:attribute name="__type" value="gmd:CI_Contact"/>
                   <nc:group name="gmd:address">
                      <nc:attribute name="__role" value="gmd:address"/>
                      <nc:attribute name="__type"
value="gmd:CI_Address"/>
                      <!--The email address is probably the most
effective and persistent contact information.-->
                      <nc:attribute name="gmd:electronicMailAddress"
                                    value="The organization responsible
```

```
for the source."
                                    __isoType="gco:CharacterString"/>
                  </nc:group>
               </nc:group>
               <!--
                The CI_RoleCode is a codelist that describes the role of
a responsibleParty in the metadata.
                See
http://standards.iso.org/iso/19115/resources/Codelist/cat/codelists.html
for standard values.
                It includes two standard attributes: the codelist
attribute gives a URL that gives the location of the codeList,
                and a value from the codelist. The location can be set
to the standard location if the standard codelist is sufficient
                for the data provider needs or, if necessary, it can be
set to a codelist that has been extended to include dataset
                specific values.
                The codeListValue attribute gives the value of the
codelist. This is also the value of the element.
    -->
               <nc:group name="gmd:role">
                  <nc:attribute name="__role" value="gmd:role"/>
                  <nc:attribute name="__type" value="gmd:CI_RoleCode"/>
                  <nc:attribute name="@codeList"

value="http://www.isotc211.org/2005/resources/Codelist/gmxCodelists.xml#
CI_RoleCode"/>
                  <nc:attribute name="@codeListValue"
value="processor"/>
                  <nc:attribute name="value"

value="/gmi:MI_Metadata/gmd:dataQualityInfo/gmd:DQ_DataQuality/gmd:linea
ge/gmd:LI_Lineage/gmd:processStep/gmi:LE_ProcessStep/gmd:processor/gmd:C
I_ResponsibleParty/gmd:role/gmd:CI_RoleCode"/>
               </nc:group>
            </nc:group>
         </nc:group>
         <!--The EX_Extent object is used in many metadata sections and
combines spatial and temporal extent information into a single object.
    It can include a text description of the extent that could come from
a common source, several kinds of geographic elements, and a vertical
element.-->
         <nc:group name="gmd:sourceExtent">
            <nc:attribute name="__role" value="gmd:sourceExtent"/>
            <nc:attribute name="__type" value="gmd:EX_Extent"/>
            <nc:attribute name="gmd:description"
                          value="A brief desctiption of the source
suitable for display along with the metadata."
                          __isoType="gco:CharacterString"/>
            <!--The EX_GeographicBoundingBox includes bounding latitudes
and longitudes (in degrees) for the resource.
    It is the most common type of geographicElement in metadata and
shouls always be provided to support simple spatial searches.-->
```

```
            <nc:group name="gmd:geographicElement">
               <nc:attribute name="__role"
value="gmd:geographicElement"/>
               <nc:attribute name="__type"
value="gmd:EX_GeographicBoundingBox"/>
               <nc:attribute name="gmd:westBoundLongitude"
                             value="-180.0"
                             __isoType="gco:Decimal"/>
               <nc:attribute name="gmd:eastBoundLongitude"
                             value="-180.0"
                             __isoType="gco:Decimal"/>
               <nc:attribute name="gmd:southBoundLatitude" value="-90.0"
__isoType="gco:Decimal"/>
               <nc:attribute name="gmd:northBoundLatitude" value="90.0"
__isoType="gco:Decimal"/>
            </nc:group>
            <!--The GeographicDescription provides an opportunity to use
common names for geographic features to describe the spatial extent of
the resource.
    This could also be the name of an event (e.g. hurricane) associated
with the resource.-->
            <nc:group name="gmd:geographicElement_d1e442">
               <nc:attribute name="__role"
value="gmd:geographicElement"/>
               <nc:attribute name="__type"
value="gmd:EX_GeographicDescription"/>
               <nc:group name="gmd:geographicIdentifier">
                  <nc:attribute name="__role"
value="gmd:geographicIdentifier"/>
                  <nc:attribute name="__type"
value="gmd:MD_Identifier"/>
                  <nc:attribute name="gmd:code"
                                value="A unique identifier for the
extent, i.e. common name for a geographic region."
                                __isoType="gco:CharacterString"/>
               </nc:group>
            </nc:group>
            <!--The EX_TemporalExtent provides a variety of ways to  to
describe the temporal extent of the resource.-->
            <nc:group name="gmd:temporalElement">
               <nc:attribute name="__role" value="gmd:temporalElement"/>
               <nc:attribute name="__type"
value="gmd:EX_TemporalExtent"/>
               <nc:group name="gmd:extent">
                  <nc:attribute name="__role" value="gmd:extent"/>
                  <nc:attribute name="__type" value="gml:TimePeriod"/>
                  <nc:attribute name="@gml:id"
value="tp_1114858.37344"/>
                  <nc:attribute name="gml:beginPosition"
                                value="2000-01-01"
                                __isoType="gml:attribute"/>
                  <nc:group name="gml:endPosition">
                     <nc:attribute name="@indeterminatePosition"
```

```
value="now"/>
                  </nc:group>
               </nc:group>
            </nc:group>
         </nc:group>
         <!--ProcesSteps associated with the source are referenced using
hrefs and XML ids-->
         <nc:group name="gmd:sourceStep">
            <nc:attribute name="@xlink:href" value="#ps_144"/>
         </nc:group>
         <!--ProcesSteps associated with the source are referenced using
hrefs and XML ids-->
         <nc:group name="gmd:sourceStep_d1e459">
            <nc:attribute name="@xlink:href" value="#ps_147"/>
         </nc:group>
      </nc:group>
      <nc:group name="namespace_1">
         <nc:attribute name="prefix" value="xml"/>
         <nc:attribute name="uri"
value="http://www.w3.org/XML/1998/namespace"/>
      </nc:group>
      <nc:group name="namespace_2">
         <nc:attribute name="prefix" value="xsi"/>
         <nc:attribute name="uri"
value="http://www.w3.org/2001/XMLSchema-instance"/>
      </nc:group>
      <nc:group name="namespace_3">
         <nc:attribute name="prefix" value="gmd"/>
         <nc:attribute name="uri"
value="http://www.isotc211.org/2005/gmd"/>
      </nc:group>
      <nc:group name="namespace_4">
         <nc:attribute name="prefix" value="gco"/>
         <nc:attribute name="uri"
value="http://www.isotc211.org/2005/gco"/>
      </nc:group>
      <nc:group name="namespace_5">
         <nc:attribute name="prefix" value="xlink"/>
         <nc:attribute name="uri" value="http://www.w3.org/1999/xlink"/>
      </nc:group>
      <nc:group name="namespace_6">
         <nc:attribute name="prefix" value="xs"/>
         <nc:attribute name="uri"
value="http://www.w3.org/2001/XMLSchema"/>
      </nc:group>
      <nc:group name="namespace_7">
         <nc:attribute name="prefix" value="srv"/>
         <nc:attribute name="uri"
value="http://www.isotc211.org/2005/srv"/>
      </nc:group>
      <nc:group name="namespace_8">
         <nc:attribute name="prefix" value="gml"/>
         <nc:attribute name="uri"
```

```
value="http://www.opengis.net/gml/3.2"/>
      </nc:group>
      <nc:group name="namespace_9">
         <nc:attribute name="prefix" value="gsr"/>
         <nc:attribute name="uri"
value="http://www.isotc211.org/2005/gsr"/>
      </nc:group>
      <nc:group name="namespace_10">
         <nc:attribute name="prefix" value="gss"/>
         <nc:attribute name="uri"
value="http://www.isotc211.org/2005/gss"/>
      </nc:group>
      <nc:group name="namespace_11">
         <nc:attribute name="prefix" value="gts"/>
         <nc:attribute name="uri"
value="http://www.isotc211.org/2005/gts"/>
      </nc:group>
      <nc:group name="namespace_12">
         <nc:attribute name="prefix" value="gmx"/>
         <nc:attribute name="uri"
value="http://www.isotc211.org/2005/gmx"/>
      </nc:group>
      <nc:group name="namespace_13">
         <nc:attribute name="prefix" value="gmi"/>
         <nc:attribute name="uri"
value="http://www.isotc211.org/2005/gmi"/>
      </nc:group>
```

```
    </nc:group>
  </nc:netcdf>
```

Usage

Lineage Content in CMR Metadata

Crosswalks

Notes