

# Sentinel-1 GRD Preprocessing Workflow <sup>†</sup>

Federico Filippini \*

Istituto Superiore per la Protezione e la Ricerca Ambientale, 48 - 00144 Roma, Italy

\* Correspondence: federico.filippini@isprambiente.it; Tel.: +39-06-5007-2438

† Presented at the 3rd International Electronic Conference on Remote Sensing, 22 May-5 June 2018; Available Online: <https://sciforum.net/conference/ecrs-3>

Received: date; Accepted: date; Published: date

## Supplementary Materials

**Computer code 1:** Sentinel-1\_GRD\_preprocessing: Standard workflow for the preprocessing of Sentinel-1 GRD satellite data

```
<graph id="S1 GRD preprocessing">
  <version>1.0</version>
  <!--
    <root xmlns:copyright="http://www.w3.org/1999/xhtml">
      <metadata>
        <author name="Federico Filippini" />
        <author contact="federico.filippini@gmail.com" />
        <copyright name="CC BY-SA" />
        <license type="GPL" />
        <license version="3" />
      </metadata>
    </root>
  -->
  <!-- usage example:
    /opt/snap/bin/gpt S1_GRD_preprocessing.xml -Presolution=10 -Porigin=5 -Pfilter='None'
    -Pdem='SRTM 3Sec' -Pcrs='GEOGCS["WGS84(DD)", DATUM["WGS84", SPHEROID["WGS84",
    6378137.0, 298.257223563]], PRIMEM["Greenwich", 0.0], UNIT["degree", 0.017453292519943295],
    AXIS["Geodetic longitude", EAST], AXIS["Geodetic latitude", NORTH]]'
    -Pinput=/media/workspace/S1A_IW_GRDH_1SDV_20160228T051920_20160228T051956_010142_0
    0EF52_AB5E.SAFE
    -Poutput=/media/workspace/S1A_IW_GRDH_1SDV_20160228T051920_20160228T051956_010142_
    00EF52_AB5E.dim
  -->
  <node id="Read">
    <operator>Read</operator>
    <sources/>
    <parameters class="com.bc.ceres.binding.dom.XppDomElement">
      <file>${input}</file>
    </parameters>
  </node>
  <node id="Apply-Orbit-File">
    <operator>Apply-Orbit-File</operator>
    <sources>
      <sourceProduct refid="Read"/>
    </sources>
  </node>
</graph>
```

```

    <parameters class="com.bc.ceres.binding.dom.XppDomElement">
      <orbitType>Sentinel Precise (Auto Download)</orbitType>
      <polyDegree>3</polyDegree>
      <continueOnFail>true</continueOnFail>
    </parameters>
  </node>
  <node id="ThermalNoiseRemoval">
    <operator>ThermalNoiseRemoval</operator>
    <sources>
      <sourceProduct refid="Apply-Orbit-File"/>
    </sources>
    <parameters class="com.bc.ceres.binding.dom.XppDomElement">
      <selectedPolarisations/>
      <removeThermalNoise>true</removeThermalNoise>
      <reIntroduceThermalNoise>>false</reIntroduceThermalNoise>
    </parameters>
  </node>
  <node id="Remove-GRD-Border-Noise">
    <operator>Remove-GRD-Border-Noise</operator>
    <sources>
      <sourceProduct refid="ThermalNoiseRemoval"/>
    </sources>
    <parameters class="com.bc.ceres.binding.dom.XppDomElement">
      <selectedPolarisations/>
      <borderLimit>500</borderLimit>
      <trimThreshold>50</trimThreshold>
    </parameters>
  </node>
  <node id="Calibration-Sigma">
    <operator>Calibration</operator>
    <sources>
      <sourceProduct refid="Remove-GRD-Border-Noise"/>
    </sources>
    <parameters class="com.bc.ceres.binding.dom.XppDomElement">
      <sourceBands/>
      <auxFile>Product Auxiliary File</auxFile>
      <externalAuxFile/>
      <outputImageInComplex>>false</outputImageInComplex>
      <outputImageScaleInDb>>false</outputImageScaleInDb>
      <createGammaBand>>false</createGammaBand>
      <createBetaBand>>false</createBetaBand>
      <selectedPolarisations/>
      <outputSigmaBand>true</outputSigmaBand>
      <outputGammaBand>>false</outputGammaBand>
      <outputBetaBand>>false</outputBetaBand>
    </parameters>
  </node>
  <node id="Speckle-Filter">
    <operator>Speckle-Filter</operator>
    <sources>
      <sourceProduct refid="Calibration-Sigma"/>
    </sources>

```

```

<parameters class="com.bc.ceres.binding.dom.XppDomElement">
  <sourceBands/>
  <filter>${filter}</filter>
  <filterSizeX>3</filterSizeX>
  <filterSizeY>3</filterSizeY>
  <dampingFactor>2</dampingFactor>
  <estimateENL>true</estimateENL>
  <enl>1.0</enl>
  <numLooksStr>1</numLooksStr>
  <>windowSize>7x7</windowSize>
  <targetWindowSizeStr>3x3</targetWindowSizeStr>
  <sigmaStr>0.9</sigmaStr>
  <anSize>50</anSize>
</parameters>
</node>
<node id="Terrain-Correction">
  <operator>Terrain-Correction</operator>
  <sources>
    <sourceProduct refid="Speckle-Filter"/>
  </sources>
  <parameters>
    <sourceBands/>
    <demName>${dem}</demName>
    <externalDEMNoDataValue>0.0</externalDEMNoDataValue>
    <externalDEMAApplyEGM>true</externalDEMAApplyEGM>
    <demResamplingMethod>BILINEAR_INTERPOLATION</demResamplingMethod>
    <imgResamplingMethod>BILINEAR_INTERPOLATION</imgResamplingMethod>
    <pixelSpacingInMeter>${resolution}</pixelSpacingInMeter>
    <mapProjection>${crs}</mapProjection>
    <alignToStandardGrid>true</alignToStandardGrid>
    <standardGridOriginX>${origin}</standardGridOriginX>
    <standardGridOriginY>${origin}</standardGridOriginY>
    <nodataValueAtSea>>false</nodataValueAtSea>
    <saveDEM>>false</saveDEM>
    <saveLatLon>>false</saveLatLon>
    <saveIncidenceAngleFromEllipsoid>>false</saveIncidenceAngleFromEllipsoid>
    <saveLocalIncidenceAngle>>false</saveLocalIncidenceAngle>
    <saveProjectedLocalIncidenceAngle>>false</saveProjectedLocalIncidenceAngle>
    <saveSelectedSourceBand>true</saveSelectedSourceBand>
    <outputComplex>>false</outputComplex>
    <applyRadiometricNormalization>>false</applyRadiometricNormalization>
    <saveSigmaNought>>false</saveSigmaNought>
    <saveGammaNought>>false</saveGammaNought>
    <saveBetaNought>>false</saveBetaNought>
    <incidenceAngleForSigma0>Use    projected    local    incidence    angle    from
DEM</incidenceAngleForSigma0>
    <incidenceAngleForGamma0>Use    projected    local    incidence    angle    from
DEM</incidenceAngleForGamma0>
    <auxFile>Latest Auxiliary File</auxFile>
  </parameters>
</node>
<node id="LinearToFromdB">

```

```

<operator>LinearToFromdB</operator>
<sources>
  <sourceProduct refid="Terrain-Correction"/>
</sources>
<parameters class="com.bc.ceres.binding.dom.XppDomElement">
  <sourceBands/>
</parameters>
</node>
<node id="Write">
<operator>Write</operator>
<sources>
  <sourceProduct refid="LinearToFromdB"/>
</sources>
<parameters class="com.bc.ceres.binding.dom.XppDomElement">
  <file>${output}</file>
  <formatName>BEAM-DIMAP</formatName>
</parameters>
</node>
<applicationData id="Presentation">
<Description>Sentinel-1 GRD Sigma0 standard preprocessing graph</Description>
<node id="Read">
  <displayPosition x="30.0" y="30.0"/>
</node>
<node id="Apply-Orbit-File">
  <displayPosition x="30.0" y="60.0"/>
</node>
<node id="ThermalNoiseRemoval">
  <displayPosition x="30.0" y="90.0"/>
</node>
<node id="Remove-GRD-Border-Noise">
  <displayPosition x="30.0" y="120.0"/>
</node>
<node id="Calibration-Sigma">
  <displayPosition x="30.0" y="150.0"/>
</node>
<node id="Speckle-Filter">
  <displayPosition x="30.0" y="180.0"/>
</node>
<node id="Terrain-Correction">
  <displayPosition x="30.0" y="210.0"/>
</node>
<node id="LinearToFromdB">
  <displayPosition x="30.0" y="240.0"/>
</node>
<node id="Write">
  <displayPosition x="30.0" y="270.0"/>
</node>
</applicationData>
</graph>

```

