ERS and Envisat SAR
Since 20+ years, ESA supports the Cryosphere communities with the provision of Earth Observation data:

• in the 80’s, with Landsat (European Arctic),
• since 1991, through ERS-1 and ERS-2 (SAR, Altimetry, Ozone monitoring),
• from 2002, with an increased capacity provided by Envisat (SAR, Altimetry, Atmospheric Chemistry, Imaging Spectrometer)
• from 2009, with the Earth Explorers (GOCE, SMOS, CryoSat).

→ ESA was the initiator of the space agencies contribution to International Polar Year 2007-2008 (GIIPSY initiative).

→ ESA is very open to collaboration with other space agencies to further improve its support to cryosphere science.
Data management (e.g. access, reprocessing) to be ensured beyond satellite operations (EOEP-4)

Missions operations funded by ESA EOEP-3 (5 years)
Missions operations funded by ESA EOEP-4 (4.5 years) (to be decided in Nov 2012)

ERS-1 1991
ERS-2 1995
Envisat 2002

GOCE
SMOS
CryoSat

Sentinel-1A, -1B
Sentinel-3A, -3B
Sentinel-2A, -2B
Sentinel-5P

ADM-Aeolus
EarthCARE
SWARM

ESA EO data gap
ESA EO data gap

Missions operations funded by European Commission
ETR-1, ERS-2 and Envisat SAR missions contributing to polar observations

<table>
<thead>
<tr>
<th>Year</th>
<th>Mission</th>
<th>Image</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1991</td>
<td>ERS-1</td>
<td><img src="image1.png" alt="ERS-1 Image" /></td>
<td>ERS-1 SAR tandem</td>
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<td>1995</td>
<td>ERS-1</td>
<td><img src="image2.png" alt="ERS-1 Image" /></td>
<td>ERS-1 SAR tandem</td>
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<td>2000</td>
<td>ERS-2</td>
<td><img src="image3.png" alt="ERS-2 Image" /></td>
<td>ERS-2 Ice Phase 2007-2008</td>
</tr>
<tr>
<td>2002</td>
<td>Envisat</td>
<td><img src="image4.png" alt="Envisat Image" /></td>
<td>ERS-2 Ice Phase 2011: Kangerdlugssuaq Ice Stream (East Greenland)</td>
</tr>
<tr>
<td>1991</td>
<td>ERS-1</td>
<td><img src="image5.png" alt="ERS-1 Image" /></td>
<td>ERS-1 SAR tandem</td>
</tr>
</tbody>
</table>

ESA IPY contribution: Antarctic ice velocity (ALOS, Envisat, Radarsat-2, ERS)

ERS-2 Ice Phase 2011: Kangerdlugssuaq Ice Stream (East Greenland)
ERS SAR archive: 

Density maps
ERS-1 and ERS-2 – Descending arc, VV polarisation

Incidence angle 23 deg
ERS-1 and ERS-2 Ice Phases

ERS-2 SAR archive – 3 days repeat (New ice phase 1992), 19th Central

Incidence angle 23 deg
Tandem missions:
ERS-1/ERS-2 tandem and ERS-2/Envisat tandem

1st PSTG SAR working group meeting, 12 November 2012
Density maps
Wide Swath mode descending arc, VV polarisation

Density maps
Wide Swath mode descending arc, HH polarisation
Density maps
Image mode S2 descending arc, VV polarisation

Density maps
Image mode S2 ascending arc, HH polarisation

Density maps
Image mode S6 descending arc, HH polarisation

Density maps
Image mode S6 ascending arc, HH polarisation

Envisat SAR archive: narrow swath mode

S2 Incidence angle 23 deg

S6 Incidence angle 35 deg

Number of overlapping scenes: 0 > 50
Envisat SAR archive

Greenland Campaign [08 Dec 2009 to 30 Jan 2010]

73 ASAR Image Mode IS6, HH ascending segments