Thematic and land subsidence maps of the Lagoon of Venice from ERS SAR interferometry

(Unit 3.2, “Morphology and Hydrodynamics of the Venice Lagoon”)
Aim of the work

Provide thematic and land subsidence maps of the Lagoon of Venice from ERS SAR interferometry

The displacement data contributes to the control of the ground vertical movements as one of the possible components of the erosion and deposition processes
ERS-1/2 Satellites (1991 - )

AMI Image Mode Geometry

SPACECRAFT ALTITUDE (785 Km NOMINAL)

SUB-SATELLITE TRACK

23°

250 Km

100 Km

In Image mode the SAR obtains strips of high resolution imagery approximately 100 Km in width, 250 Km to the right of the sub-satellite track.
The interferometric phase $\phi$

$$\phi = \phi_{\text{topo}} + \phi_{\text{disp}} + \phi_{\text{atmo}} + \phi_{\text{noise}}$$

$$\phi = \frac{4\pi}{\lambda} B_{\|} + \frac{4\pi}{\lambda} r_{\text{disp}} + \frac{4\pi}{\lambda} r_{\text{atmo}} + \phi_{\text{noise}}$$

$B_{\|}$: component of the baseline parallel with the line-of-sight direction

$r_{\text{disp}}$: displacement of the scatterer in the line-of-sight direction

$r_{\text{atmo}}$: path length changes due to different atmospheric conditions during the acquisitions of the two SAR images
Differential Interferometry

SAR image 23 April 1997

SAR image 24 March 1999

DiffINSAR pair: 23 April 1997 - 24 March 1999 complex differential interferogram

DEM shaded relief

Unwrapped interferogram

WP 2.2.1
Differential Interferometry

Stacking (atmosphere reduction)

<table>
<thead>
<tr>
<th>Orbit</th>
<th>Date</th>
<th>Perpendicular baseline</th>
<th>Acq. time interval</th>
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<td>07782_00477</td>
<td>10.01.93_24.05.95</td>
<td>3 m</td>
<td>864 giorni</td>
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<td>595 giorni</td>
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Geocoding

Date presentation and interpretation
Geocoded (30 m) landuse map of the Lagoon of Venice from satellite radar interferometry (ERS-1/2)

- Tandem coherence (red)
- Backscattering intensity (green)
- Backscattering intensity change (blue)
Geocoded (30 m) landuse map of the Lagoon of Venice from satellite radar interferometry (ERS-1/2)
Land subsidence map from SAR interferometry 1993 - 2000
Land subsidence map from SAR interferometry 1993 - 2000
Chioggia
Litorale di Lido

Brondolo  Litorale di Lido  Jesolo
Litorale di Lido
Jesolo
Mestre
Treviso
Outlook

Interpretation

Interferometric Point Target Analysis