AN: **EP31B-0743**
TI: Geodynamics of Venice tidal marshes observed by radar interferometry
AU: ***Tosi, L**
EM: *luigi.tosi@ismar.cnr.it*
AF: *Institute of Marine Sciences, National Research Council, Venezia, Italy*
AU: **Teatini, P**
EM: *teatini@dmsa.unipd.it*
AF: *Dept. of Mathematical Methods and Models for Scientific Applications, University of Padova, Padova, Italy*
AU: **Strozzi, T**
EM: *strozzi@gamma-rs.ch*
AF: *Gamma Remote Sensing A.G., Gümligen, Switzerland*
AB: Inter-tidal environments, such as lagoons and deltas, are naturally dynamic coastal systems that are unique in their close links to both land-based fluvial and coastal sea processes. These landscapes are generally experiencing a destructing phase over the last decades primarily caused by river sediment trapping in the upland drainage basins, sea level rise due to climate changes, and land subsidence. Accurate monitoring of the geodynamics of tidal environments is very difficult because of various concurrent causes: i) the logistical difficulties (or inaccessibility) to reach the areas precluding the use of traditional leveling and differential GPS surveys; b) the limited effectiveness of permanents GPS stations due to the significant small-scale variability of the litho-stratigraphy and the soil hydro-geomechanical properties because of the recent development of these environments, usually occurred over the late Holocene; and c) the lack of permanent natural/anthropogenic structures that reduces the capability of SAR interferometry. Because land subsidence is expected to give an important contribution to the cumulative sediment budget of the Venice Lagoon, Italy, the Venice Water Authority has supported a research aimed at improving the quantification of the present land subsidence by exploring the use of radar interferometry on a number of artificial corner reflectors. A network of 58 trihedral corner reflectors (TCR) was installed in the salt marshes of the Venice Lagoon before the summer 2007. The TCR are characterized by 60 cm long edge, made of aluminium to reduce their weight, placed in areas without any other strong scatterer, and oriented to be visible with ENVISAT ASAR and TerraSAR-X acquisitions of descending orbits. Salt marshes are constantly visible, except when the tide rises. The TCR, usually installed at a height of 1 m above the mean sea level, are therefore constantly outside the water. In order to mitigate atmospheric artifacts and to properly resolve the radar phase ambiguity, the TCR network has been planned to keep to a value of about 1.0-1.5 km the maximum distance between the TCR or between an "artificial" and the adjacent "natural" reflector. Persistent scatterer interferometry has been applied on a number of 65 ENVISAT scenes spanning the time interval form February 2003 to December 2009. Specific procedures have been implemented to improve the accuracy of the interferometric solution on the TCR and to include it into the global interferometric point target analysis on natural targets. For the first time we have so proved the possibility of precisely quantifying the geodynamic evolution of large-scale tidal environments. As expected, a significant variability of the displacement rates has been recorded, ranging between a general stability to subsidence up to 5 mm/yr. Very interesting general and site-specific results have been obtained relating the observed displacements with the morphological evolution of the tidal marshes.
DE: [1855] HYDROLOGY / Remote sensing
DE: [1890] HYDROLOGY / Wetlands
DE: [3020] MARINE GEOLOGY AND GEOPHYSICS / Littoral processes
SC: Earth and Planetary Surface Processes (EP)
MN: 2010 Fall Meeting