# FLOOD MAPPING USING ERS TANDEM COHERENCE IMAGE : A case study in South France

L. Marinelli GEOIMAGE ; 80, route des Lucioles ; 06560 Valbonne ; France ; Tel : (33) 4.93.00.40.00 ; Fax : (33) 4.93.00.40.01 100363.3423 compuserve.com

R. Michel C.E.A. ; DASE/LDG ; 91680 Bruyères-le-Chatel ; France ; Tel : (33) 1.69.26.62.76 ; Fax : (33) 1.69.26.70.23 michel ldg.bruyeres.cea.fr

A. Beaudoin LCT Ceangref-ENGREF ; 34093 Montpellier ; France ; Tel : (33) 4.67.54.87.52 ; Fax : (33) 4.67.54.87.00 beaudoin teledetection.fr

J. Astier BRL Ingénierie ; 33001 Nîmes ; France ; Tel : (33) 4.66.87.50 ; Fax : (33) 4.66.87.51.09

## Abstract

**Flood mapping proved to be feasible using multitemporal ERS SAR amplitude images. However, it allows to map the flood extent only at the acquisition time, rarely corresponding to the maximal extent, which is of greater interest for applications. However, it was shown that the coherence was more sensitive to surface changes than the backscatter amplitude. Therefore, coherence should detect areas where flood-induced surface changes occurred, possibly corresponding to the maximal flood extent within the repeat-pass acquisition window.**

**We analysed a coherence image obtained from a Tandem pair acquired on a major flood that occurred in 1996 in the Hérault Département, South France. The 2 images were acquired respectively on 28 & 29 January 96, that is during and after the severe rainfall that caused the flood. An orthorectified coherence image was created. The coherence degree was derivated using a sliding Hanning window with compensation of the interferogram local slope. Then, the coherence map was integrated in a GIS and analysed taking into account the drainage network, terrain observations and the simulated flood extent obtained from water stage measurements and hydraulic modelling.**

**As expected, flooded areas are easily detected, as they exhibit very low coherence with sharp edges. More interesting, detected flooded areas are 1) significantly larger than those obtained from combined amplitude images and 2) in higher agreement with the maximal flood extent. This can be explained from the various situations (flooded at both dates, only at one date, or temporarily in between) and related surface changes (moving water, presence or not of water, variation of soil moisture and roughness) that occurred within the maximal extent and during the acquisition window.**

**Therefore, coherence images appear to be an efficient and complementary tool to amplitude data, for flood mapping. In a next step, we will analyse the potential of ERS repeat-pass on the usual 35-days cycle, towards pre-operational demonstration purposes.**

*Keywords: Flood Mapping, ERS Repeat-pass Interferometry, Coherence Image, Surface Changes*