The use of radar DINSAR technique for the assessment of mass movements in Austria
Filippo Vecchiotti, Arben Koci, Nils Tich, Edmund Winkler
Geologische Bundesanstalt

1. Introduction
Considering that in the past the Differential Interferometry SAR was a technique used only by a restricted scientific community nowadays the number of opportunity for governmental organisations to acquire and process SAR images in house is largely augmented. In fact, it’s now possible to use open source software which enable a competent user to visualize, process and analyse available ESAERS and ENVISAT data. The GBA is involved in a EU project called PanGeo aimed at detecting and mapping the through the analysis of state of the art PSI (persistent scattering interferometry), geo-hazard related to terrain motion in two of the biggest cities of Austria (Salzburg and Vienna). The department of engineering geology by applying for an EarthNet ESA project is preparing a cost effective strategy for data processing of SAR images in the aim of assessing the Austrian landslide cadastre.

2. Theory and software
New functionalities of open source software like EOLI-SA (ordering SAR images in the aim of assessing the Austrian landslide cadastre.

3. Strategy
In order to accomplish the project "Austrian landslide catalogue assessment through the use of radar interferometry application" the GBA will adopt a method (2) which takes into account pre-triggering and post-triggering related landslide events in Austria (landslides, extreme rainfall, extreme snowfalls, flooding) and compare the DINSAR results with the GEORIOS cadastre. The main product of PanGeo consists on the creation for each city of a ground stability layer. This layer, coupled with a hybrid reporting the interpretation of the phenomena, contain the aerial extensions of the geo-hazards Furthermore PanGeo portal will publish those results on a web GIS application (9).

4. Modelling
The first part of the analysis for the nationwide project was addressed to the creation of the PSI predictability model (2) based on slopes, aspects and land use and use it as a references for forecast the higher probability to detect potential very slow mass movements catalogue on the GEORIOS (9) cadastre. More than 600 features with extent > 10 hectares are susceptible to be detectd in short by using classic two pass DINSAR method.

5. Vienna preliminary results - PanGeo examples
Since PSI ERS data (1995 -2000) correspond to the time frame of the geo-hydrological investigation it’s possible to see in 6a an overall well response of the satellite to weather fluctuation. In 6b the results on the ground water table level before and after the construction of a Freudenau dam on the Danube.

6. Conclusions
The versatility the PSI data can be proved in non urban environment as well as it happen in couple of cases in Salzburg (9). The presence of few scatters in Werenwaed on Flysh persuaded us to make a verification on the field. At the northern part of Kottbeberg hill a particularly active channel created by under cutting a deep graben. On 7a it’s possible to see in fact the extreme action of the erosion (the fall of an old tree) in 7b the deep graben itself and in 7c the bending of young trees.

7. Bibliography
(1) the term  _m_  _i_  or noise on the interferogram is a complex number so that _Φ_  = _Φ_  _m_  _i_  and
(2) the term decorr or noise on the interferogram is a complex number so that _Φ_  = _Φ_  _m_  _i_.

8. Rain verification
(http://ceos.esa.int/plenary16/papers/plenary16_doc14_dmsg_final/final_report/DMSG_final.pdf)  
(3) PSI processing of the project.

1. Work flow for the creation of an unerapped differential interferogram.
2. Work flow for the SAR processing of the project.
3. PSI predictability model for ascending orbits (right acquisitions) describing the probability to find persistent scatters overall Austria.
4. Where P estimated PSF (4) for one of the 50 Km by 50 Km site HESTALP (9) snow probability compared to the ESRI snow layer.
5. location map of the hot spot of subsidence present in Margareten and part of Munding.
6. ENVIISAT data 2014 - 2015 (mm) groundwater difference 1995 -2000 (m)
7. location map of the graben investigated in Werenwaed.
8. ERS data 1995 -2000 (mm), groundwater difference 1995 -2000 (m)
9. The main product of PanGeo consists on the creation for each city of a ground stability layer. This layer, coupled with a hybrid reporting the interpretation of the phenomena, contain the aerial extensions of the geo-hazards Furthermore PanGeo portal will publish those results on a web GIS application (9).