The Big Data Era in Sky and Earth Observation Cost Action (BIG-SKY-EARTH)

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Big Data Era in Sky and Earth Observation (BIG-SKY-EARTH, http://www.bigskyearth.eu) is COST Action that aims at setting the ground for a long-term networking between astronomy and remote sensing research communities in the area of Big Data utilization. The purpose of BIG-SKY-EARTH is to emphasize similarities between these disciplines and boost the communication within and between the emerging field of astroinformatics and its older Earth Observation counterpart geoinformatics, in close collaboration with computer scientists. The Action is now entering its final year and the results are visible on several scales. There are many examples of concrete "industrial cross-pollination" stories where BIG-SKY-EARTH facilitated exchange of methods and knowledge between network participants. For example, remote sensing and astronomy big data repositories for meteorological nowcasting, thermosolar energy production forecasting, astronomy big data analytics libraries for wind farm predictive maintenance visualization, astronomy and remote sensing C-based stack for scalable numerical analysis used in advanced manufacturing analytics, GPU analytics for remote sensing and industrial analytics, or developing astronomy platform on the top of commercial remote sensing airship to enable transfer the same technology to a high-resolution remote sensing platform. Some of those collaborations expanded into research papers or even project proposals for H2020 based on partnerships between academia and industry, including developing new types of astronomy and remote sensing research based on innovative airship technologies. The Action has also organized three training schools so far: "Big Data Processing" (Oberpfaffenhofen, Germany), "Big Data Visualization" (Preston, UK), "Big Data GPU Analytics" (San Sebastián, Spain). On the level of the entire networking, the Action is also working on the book "Big Data in AstroGeoInformatics" and accompanying code and algorithm repository. Altogether, the established level of activity and interests for further collaboration suggest that this networking will actively continue also after the official end of COST funding. This presentation will also show two examples of research activities that the presenter started thanks to BIG-SKY-EARTH. The first example focuses on the Precipitable Water Vapor (PWV) estimated from Sentinel-1 images using the SAR interferometry technique. Large databases of high resolution Sentinel-1 PWV maps will need to be analyzed before their assimilation in Numerical Weather Models and use for the estimation of geophysical parameters. This research started during an STSM visit at the Finnish Geospatial Research Institute led to the first tools for the analysis of PWV time series in terms of terrain topography and landcover and the visualization of atmosphere thermodynamic quantities [1]. The second example is on the mapping of the Snow Water Equivalent (SWE) using Sentinel-1 SAR images[2-4].

References:
[1]G.Nico,A.Gil,M.Quartulli,P.Mateus,J.Catalao,Merging InSAR and GNSS meteorology:how can we mine InSAR and GNSS databases to extract and visualize information on atmosphere processes?,Proc.of Big Data from Space(BIDS),375-378,2017
[2]V.Conde,G.Nico,P.Mateus,J.Catalao,A.Kontu,M.Gritsevich,Snow Water Equivalent Retrieval Using Synthetic Aperture Radar(SAR) Interferometry,Proc. 8th EARSeL workshop on Land Ice and Snow,2017
[3]V.Conde,G.Nico,J.Catalao,A.Kontu,M.Gritsevich,Wide-area mapping of snow water equivalent by Sentinel-1&2 data,Geophysical Research Abstracts Vol.19, EGU2017-9580-1,2017
[4]V.Conde,G.Nico,P.Mateus,J.Catalão,A.Kontu,M.Gritsevich,On the estimation of temporal changes of snow water equivalent by spaceborne SAR interferometry: a new application for the Sentinel-1 mission,Journal of Hydrology and Hydromechanics,DOI:10.2478/johh-2018-0003,2017