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TOWARDS SEAMLESS INTER-OPERABILITY BETWEEN GLOBAL EO-DERIVED DEM PRODUCTS: OPPORTUNITIES AND THREATS

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ABSTRACT:

Downstream processing of EO data over land (and some continental shelves) for applications in land and atmospheric retrieval require for some ≈30% of the Earth's land surface, corrections for topographic relief and/or slope and aspect. For traditional mapping applications, this requires a Digital Elevation Model (DEM) of the "bare earth" land surface. As spatial resolution of the VIS/IR/SAR image increases, so does the need to improve DEM spatial resolution and relative and absolute height accuracy. Fortunately, such global DEMs are now being produced from spaceborne EO sensors, such as from SAR (SRTM, TerraSAR-X, TanDEM-X), stereo-photogrammetric (ASTER, SPOT, PRISM and IRS-3P) and lidar (ICESat). EO-DEMs usually measure the observable canopy elevation which can vary from top-of-canopy through to the bare earth depending on the technique and wavelength employed. Each EO comes with limited validation and in some cases use different datums, spheroids and co-ordinate systems.

QA4EO guidelines have been developed by the CEOS WG on Calibration/Validation to provide a Quality Indicator for each and every measurement for use in improving inter-operability between different sources of EO-derived geophysical products. We discuss the state of these QI estimates for each of the different sources of the global DEMs and what this implies for the production of a future fused DEM at 30m for use with most global EO sensors (e.g. Sentinel-1,2,3; Landsat-8, VIIRS). It is demonstrated that the continuing lack of a sensible QI for ASTER will make it difficult to employ this global DEM source and how this gap can be filled. The potential of repeat pass DEM measurements is evaluated with respect to the generation of higher spatial resolution DEMs once they are co-registered to a global co-ordinate reference network such as that from ICESat. A prototype web-GIS will be shown for use in evaluating different EO-DEM sources.

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