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Global dynamic topography: geoscience communities requirements

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The advent of free-of-charge global topographic data sets SRTM and Aster GDEM have enabled testing a host of geoscience hypotheses. This is because they first revealed the relief of previously unavailable earth landscapes, enabled quantitative geomorphometric analyses across entire landscapes and improved the resolution of measurements. Availability of such data is now considered standard, and though resolved at 30-m to 90-m pixel, which is amazing seeing where we come from, they are now regarded as mostly obsolete given the sub-meter imagery coming through web services like Google Earth. Geoscientists now appear to desire two additional features: field-scale-compatible elevation datasets (i.e. meter-scale digital models and sub-meter elevation precision) and dispose of regularly updated topography to retrieve earth surface changes, while retaining the key for success: data availability at no charge.

A new satellite instrument is currently under phase 0 study at CNES, the French space agency, to fulfil these aims. The scientific community backing this demand is that of natural hazards, glaciology and to a lesser extent the biomass community. The system under study combines a native stereo imager and a lidar profiler. This combination provides spatially resolved elevation swaths together with absolute along-track elevation control point profiles. Data generated through this system, designed for revisit time better than a year, is intended to produce not only single acquisition digital surface models, colour orthoimages and small footprint full-wave-form lidar profiles to update existing topographic coverages, but also time series of them. This enables 3D change detection with centimetre-scale planimetric precision and metric vertical precision, in complement of classical spectral change appoaches.

The purpose of this contribution, on behalf of the science team, is to present the mission concepts and philosophy and the scientific needs for such instrument including foreseen societal benefits.