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Global density water variations by cumulating daily satellite gravity information

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We propose a new method to produce time series of global maps of surface mass variations by integrating progressively daily geopotential changes measured by orbiting satellites. In the case of the Gravity Recovery And Climate Experiment (GRACE) mission, these geopotential variations can be determined from very accurate inter-satellite K-Band Range (KBR) rate measurements of daily 5-second sampled satellite orbits. In particular, the along-track gravity contribution of hydrological mass changes is extracted by removing de-aliasing models for the static [U+FB01]eld, and high-frequency mass changes in the atmosphere and the oceans (including periodical tides), as well as the polar tides. The potential residuals from this reduction are used to recover surface mass density changes - in terms of Equivalent-Water Height (EWH) - over a global network of triangular surfaces. These surface tiles of $\sim$100,000 km^2 are defined to be of equal areas over the terrestrial sphere. We have developed two strategies for the determination of surface mass changes: (i) a Kalman-type assimilation of reduced geopotential data, and (ii) a regularization with spatial constraints. These approaches were tested by inverting along-track potential residuals, and successfully applied to produce successive grids of surface mass density. These inversions will be useful for exploring the possibility of refining time and space resolutions for ocean and land studies that would be hopefully brought by future low-altitude geodetic missions.