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Long-term mass changes over Greenland derived from high-low satellite-to-satellite tracking

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In the last decade, temporal variations of the global gravity field have become an ubiquitous and invaluable source of information for geophysical and environmental studies. It is important that the time series of observations is not interrupted as some geophysical phenomena, e.g. postglacial rebound or long term ice mass trends, are only beginning to be observable. To date, the most valuable source for time variable gravity (TVG) is the GRACE mission which has already exceeded its nominal lifetime. It can cease operations any time now and then only high-low satellite-to-satellite (hl-SST) observations will be available. These observations have, however, only demonstrated limited application for TVG. In this presentation, we show that by using CHAMP data, a thorough reprocessing strategy and a dedicated Kalman filter it is possible to derive the very long wavelength features of the time variable gravity field. The results are validated against GRACE data and height coordinates from long-term GPS ground stations in Greenland. We find that the quality of the CHAMP solutions is sufficient to derive realistic long-term trends and annual amplitudes of mass changes of Greenland. We conclude that hl-SST would be a viable substitute (although at lower spatial resolution) for TVG in the event of a profund operational breakdown of GRACE.