Simulating a 40-year flood event climatology of Australia with a view to ocean-land teleconnections

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We develop, for the first time, a proof-of-concept version for a high-resolution global flood inundation model to generate a flood inundation climatology of the past 40 years (1973-2012) for the entire Australian continent at a native 1 km resolution. The objectives of our study includes (1) deriving an inundation climatology for a continent (Australia) as a demonstrator case to understand the requirements for expanding globally; (2) developing a test bed to assess the potential and value of current and future satellite missions (GRACE, SMAP, ICESat-2, AMSR-2, Sentinels and SWOT) in flood monitoring; and (3) answering science questions such as the linking of inundation to ocean circulation teleconnections.

We employ the LISFLOOD-FP hydrodynamic model to generate a flood inundation climatology. The model will be built from freely available SRTM-derived data (channel widths, bank heights and floodplain topography corrected for vegetation canopy using ICESat canopy heights). Lakes and reservoirs are represented and channel hydraulics are resolved using actual channel data with bathymetry inferred from hydraulic geometry. Simulations are run with gauged flows and floodplain inundation climatology are compared to observations from GRACE, flood maps from Landsat, SAR, and MODIS. Simulations have been completed for the entire Australian continent. Additionally, changes in flood inundation have been correlated with indices related to global ocean circulation, such as the El Niño Southern Oscillation index.

We will produce data layers on flood event climatology and other derived (default) products from the proposed model including channel and floodplain depths, flow direction, velocity vectors, floodplain water volume, shoreline extent and flooded area. These data layers will be in the form of simple vector and raster formats. Since outputs will be large in size we propose to upload them onto Google Earth under the GEE API license.