



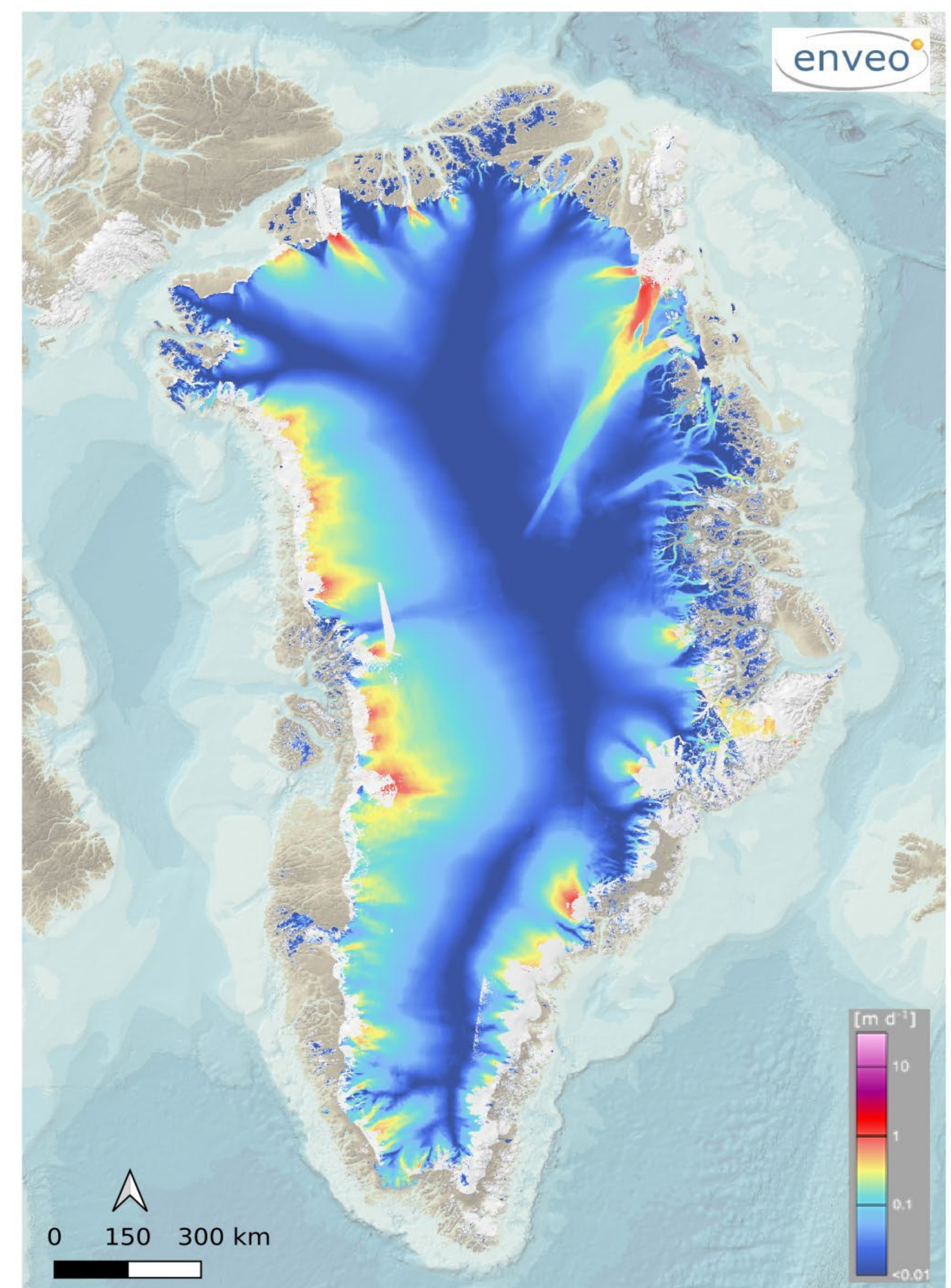
Essential Climate Parameters for the Greenland IceSheet

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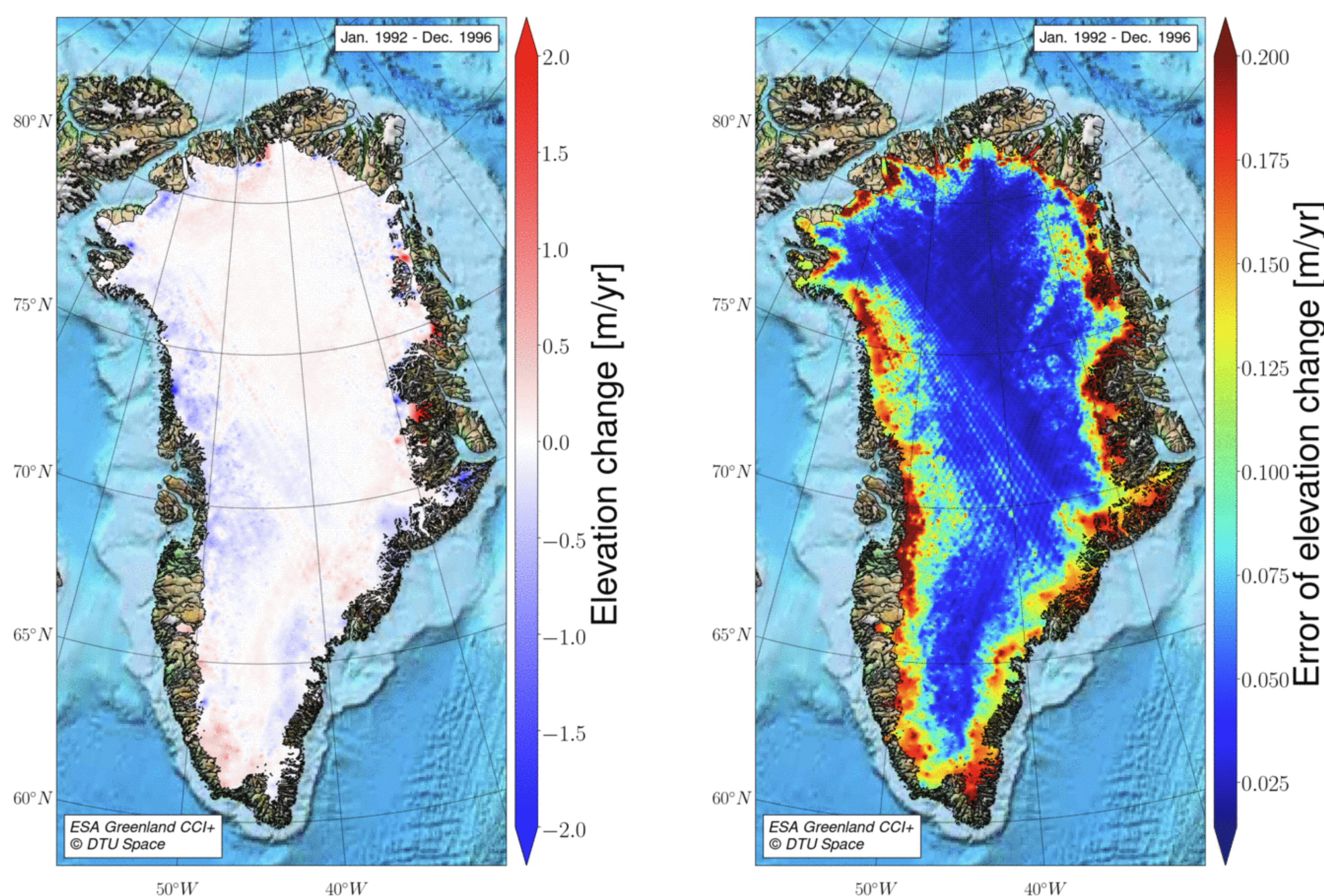
The ESA "Greenland_ice_sheet_cci" project is making past and present space measurements of Greenland ice sheet changes available for scientists, stakeholder and the general public. Data are part of a large set of ECV's made available by the ESA Climate Initiative, as a contribution to GCOS. In the CCI+ the following data are produced:

- Time series of surface elevation changes (SEC)
- Ice Velocities from S-1 radar interferometry (IV)
- Mass balance time series from GRACE/GRACE-FO (SMB)
- Mass flux and ice discharge from outlet glacier (MFID)
- Melt lakes of the ice sheet (selected areas)

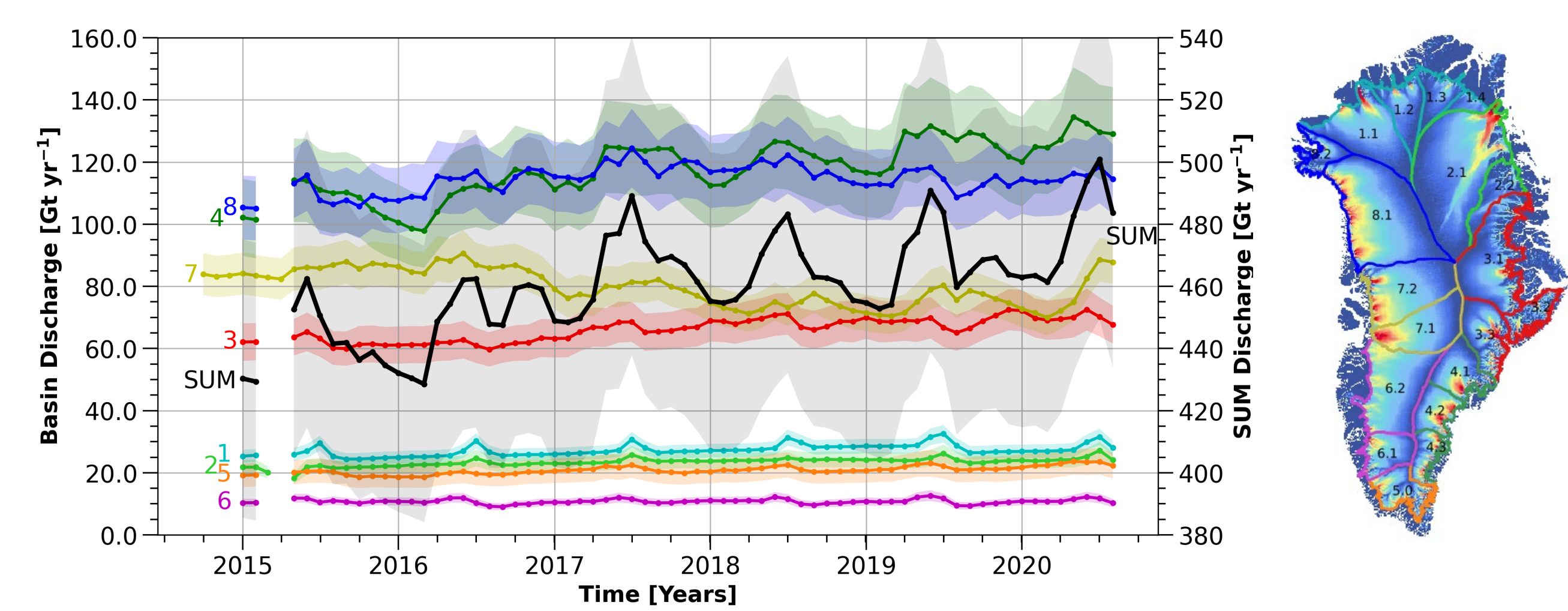
Subsets of SEC, IV and GMB data are also implemented in the **Copernicus Climate Change Service**. Greenland data are available via <http://products.esa-icesheets-cci.org/> as well as the CCI common portal.



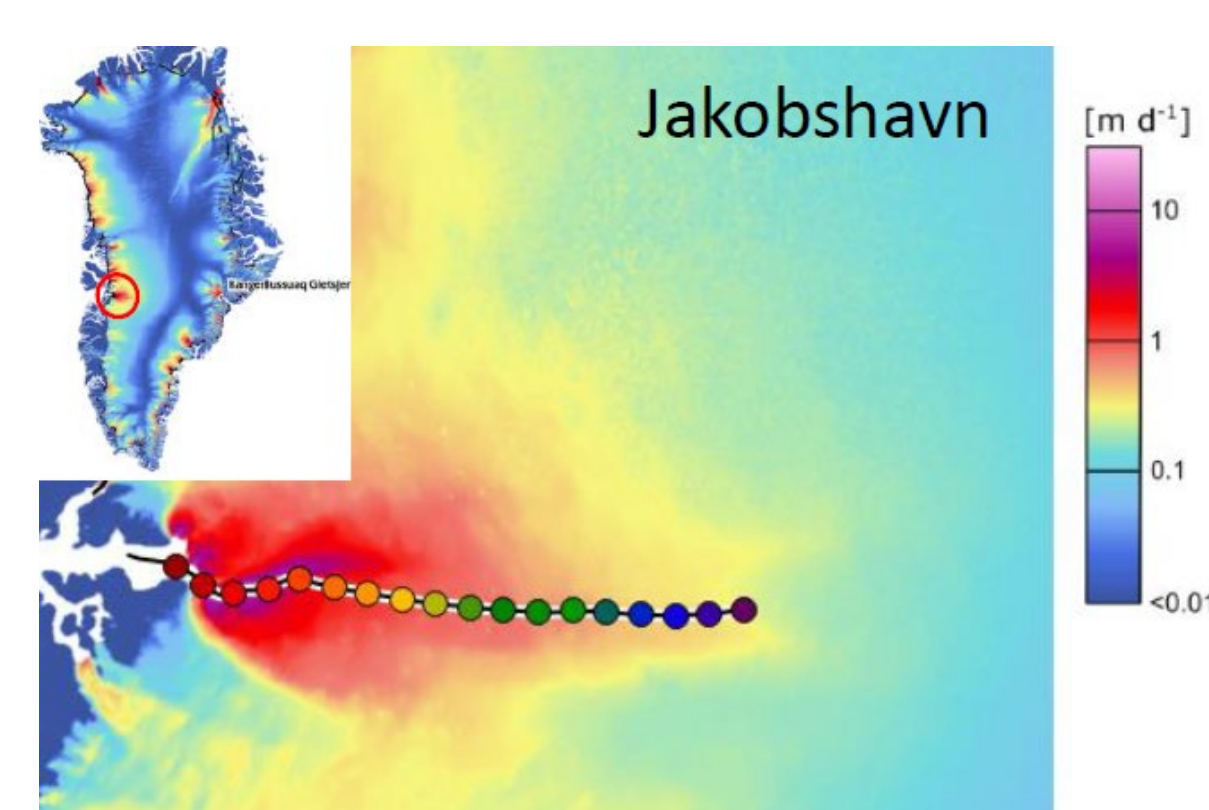
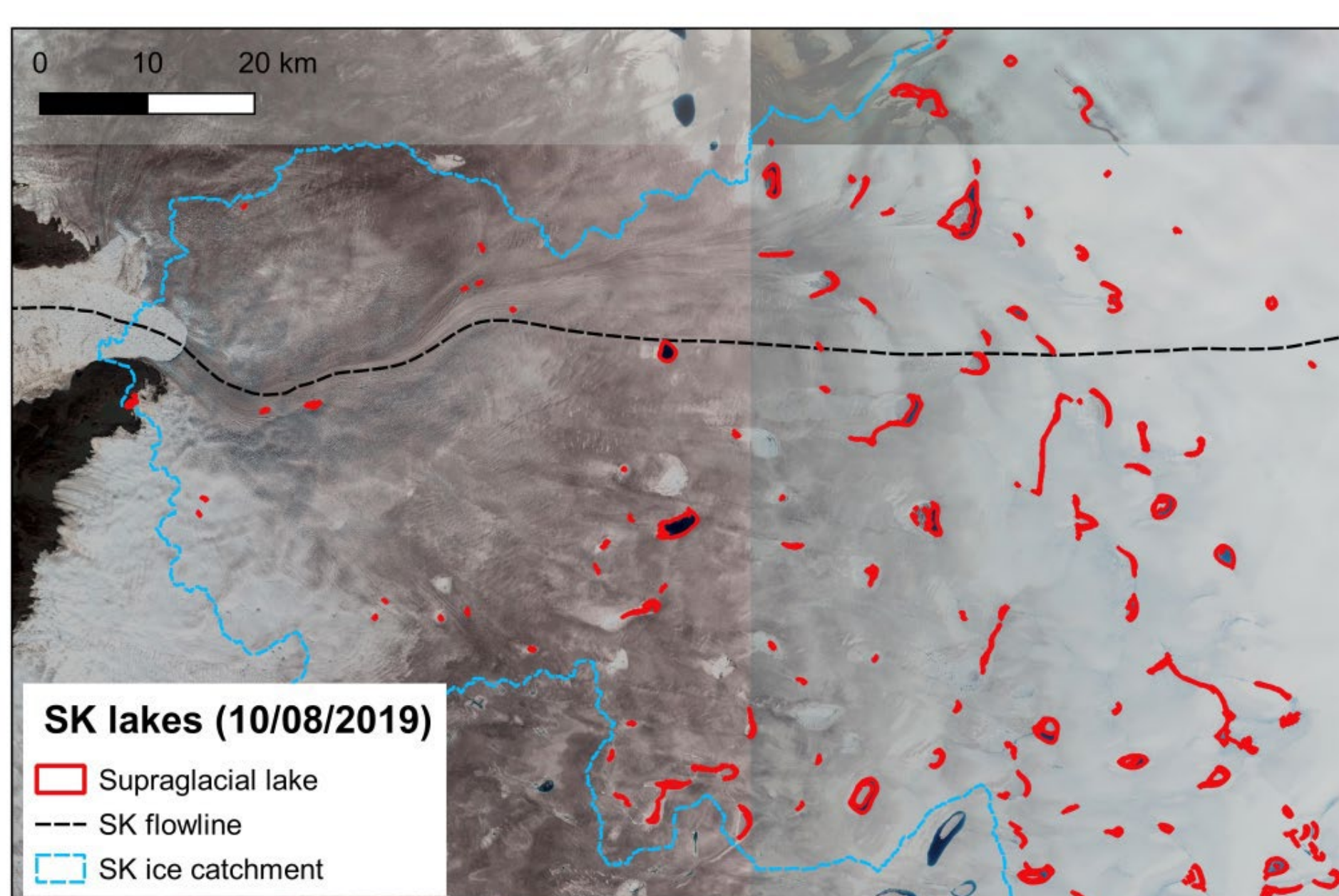
Velocity map of the Greenland ice sheet 2019-20 from Sentinel-1 SAR interferometry – new software much improved over earlier feature tracking



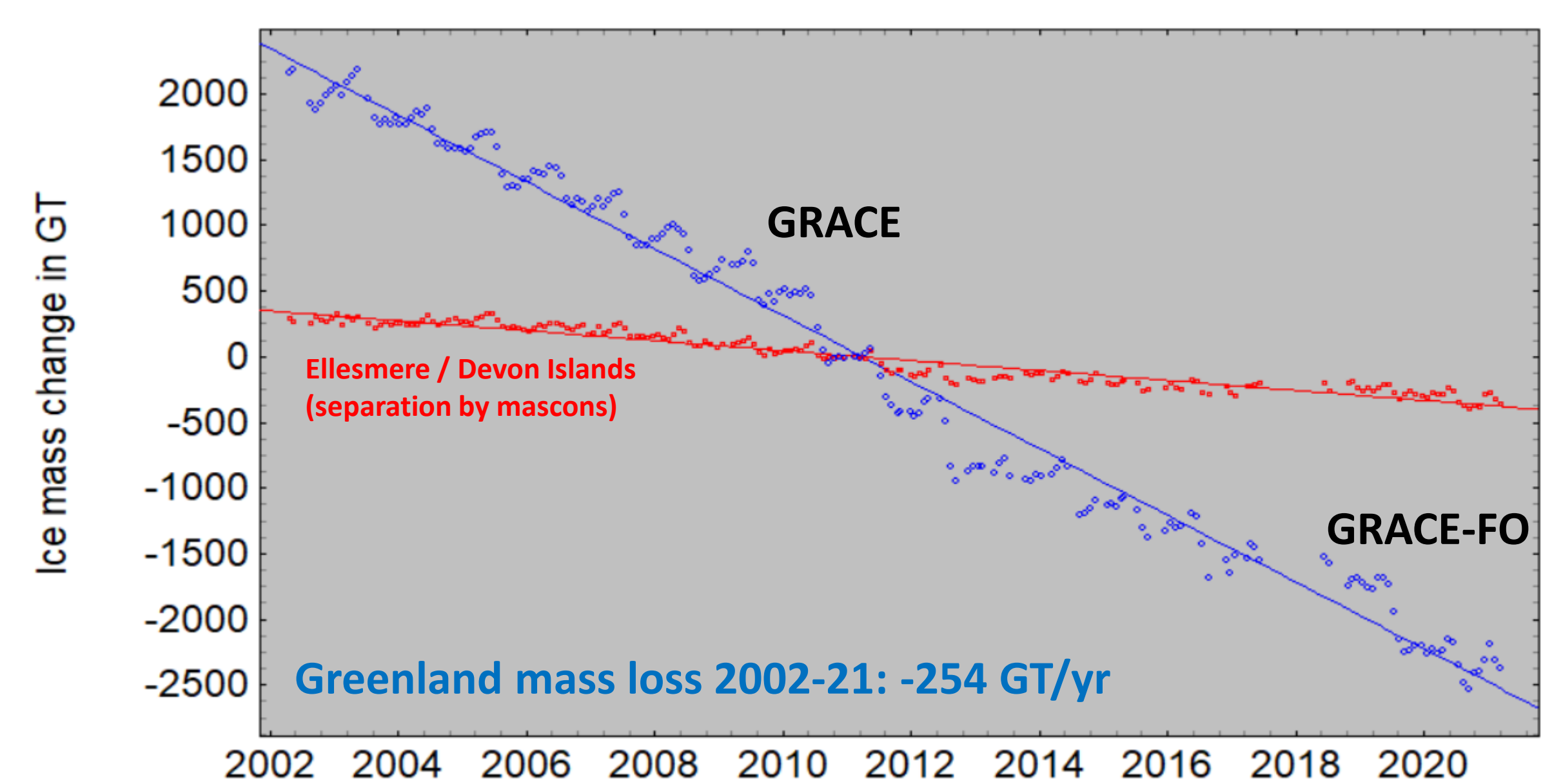
New surface elevation change products from 1992 to present, based on CryoSat, Envisat, ERS and Sentinel-3 radar altimetry. New unified Kriging software allows better coverage in sloping margin regions, utilizing empirical correlation with IV, and confirmed by IS-2.



Ice velocities combined with outlet glacier "gate" thickness confirm the increasing mass loss of the Greenland ice sheet for individual "Zwally" ice sheet drainage basins (new ECV "mass flux and ice discharge")



Mapping of melt lakes on the ice sheets allows correlation with rapid melt events, increasing outlet glacier velocities (example from Jakobshavn Isbræ)



Ice mass changes from GRACE/GRACE-FO confirm the continuing mass loss and also interannual variations associated with record melt events (e.g. 2012/2019)