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IceLines – A new service to monitor Antarctic ice shelf front dynamics

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Antarctica`s coastline is constantly changing by moving ice shelf margins and glacier tongues. This can influence the discharge of the Antarctic Ice Sheet if ice shelf areas with buttressing forces are involved. By now, glacier and ice shelf front changes are not tracked continuously due to time-consuming manual work. Hence, dynamics of the calving front position are often simplified by using the steady-state-calving assumption for modelling. To provide modelers with frequent and continuous time series of calving front change, we introduce the ice shelf front monitoring service “IceLines”. IceLines monitors major Antarctic ice shelf fronts based on Sentinel-1 radar imagery. The data set is automatically updated on a monthly basis and can be accessed via the EOC GeoService (geoservice.dlr.de) hosted by DLR. IceLines automatically downloads and pre-processes Sentinel-1 data for 36 selected shelves and glaciers, extracts the calving front based on a deep neural network and optimizes the result by post-processing. The processing chain of IceLines presents unprecedented dense time series of calving front change during the era of Sentinel-1 (2014-today). Whereas many previous challenges for automatic calving front detection were tackled (e.g. various glacier morphologies, backscatter changes, different polarizations), some limitations exist for ice shelves with excessive surface melt during summer or dry snow facies close to the front. We will present the current implementation, the derived calving front time series and validation results of IceLines. Discussions with the modelling community are welcome to further improve the IceLines data set for ice sheet and ice shelf modelling applications.