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Changes in Antarctic ice-sheet model initialisation over the satellite era, from ERS1-2 to Sentinel

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The accuracy of the Antarctic ice sheet future behaviour as predicted by ice-sheet models relies on ice-sheet initialisation, which is performed by the inversion of observed data (usually ice surface velocity and thickness) mostly collected using satellites, in order to infer the poorly known parameters of the ice sheet (e.g., basal friction, which is not accessible to observations). Over the past 25 years, the amount and resolution of satellite data has dramatically increased, which enables to initialise the ice sheet for different time periods and accuracy. Therefore, the choice of a specific period of time for ice sheet initialisation needs to be made with great care, as some parts of the Antarctic ice sheet may not have been in steady state over the satellite era. In the frame of the European Space Agency Antarctic Climate Change Initiative (ESA-CCI) project, we aim at initialising the Antarctic ice sheet for different periods of time, depending on the availability of satellite data. To do so, we use two ice sheet models of different complexity. The faster and less complex is the fast Elementary Thermomechanical Ice Sheet (f.ETISH) model that is applied to the whole Antarctic ice sheet, and the more complex (hence the slower) is the higher order model BISICLES that is applied to specific drainage basins in Dronning Maud Land, East Antarctica. We initialise those ice sheet models for each of the last three decades, using datasets processed from the European Remote-Sensing (ERS-1 and ERS-2), the Envisat, the Radarsat-1 and Radarsat-2, and the most recent Sentinel-1 satellites, which gives a representative evolution of initial states. We show the results and discuss the relevancy of continuously surveying ice sheets in order to improve predictions of their future contribution to sea level rise.