Geophysical Research Abstracts
Vol. 20, EGU2018-3289-2, 2018
EGU General Assembly 2018

The interconnectivity of ice-sheets: implications for future sea-level change

Luke Jackson, Andrew Martinez, and Felix Pretis
Programme for Economic Modelling (EMOD), Nuffield College, Oxford University, UK (luke.jackson@economics.ox.ac.uk)

The greatest sources of uncertainty for future sea-level rise are the world's ice sheets. While numerical simulations of ice sheet change are successful in reproducing surface mass-balance (SMB, the difference between accumulated snowfall and surface melt), rapid ice dynamics remain an area of deep uncertainty. These mechanisms include ice melt ponding, submarine melting, basal lubrication, ocean melting/interaction, ice cliff failure and ice sheet fracturing. In addition to this uncertainty, little research has been conducted into the present interconnectivity between the ice sheets (Antarctica can be separated into East and West), whether changes in an ice sheet drive changes in another and visa-versa. Clearly external drivers impact all ice sheets (e.g. temperature and precipitation) but not in the same way and underlying causal relations between ice sheets will either reflect these or other mechanisms.
To understand the potential relationship between the three ice sheets (Greenland, West and East Antarctica) we analyse satellite derived mass-balance estimates, whose signal combines SMB and rapid dynamics, using a statistical methodology called vector-auto regression. We find that a twice integrated auto-regressive model, which is composed of two linear relationships (Greenland, West Antarctica and an external linear trend, and West and East Antarctica) is successful in estimating the mass-balance observations. This result points to present-day ice sheet mass evolution, and its first derivative being a non-stationary process.