Updates on DOE (& other) Activities

DOE PISCEES: development of next-gen. dynamical cores (Kalashnikova, Martin, Zhang talks), tools / methods for V&V (Evans SEWG talk) and UQ (Jackson talk), and integration into ESMs (ACME, CESM – Fyke & Sacks talks)

DOE-supported land ice modeling in ACME: focus on the contribution of Antarctic ice sheet to sea-level rise during the next few decades as a result of ice sheet – ocean interactions (development activities aligned with PISCEES)

CISM2 release in ~July 2014; aim to support as part of CESM in spring 2015 CESM release; fully supported with CESM2 release (Lipscomb talk)

Between now and 2015 CESM release – testing and initial simulations (& publications) using CISM2 in CESM (for Greenland), done in part with support from DOE RGCM to LANL

Land ice projects submitted to recent DOE SciDAC Univ. call:

- improve paleo ice sheet simulation capabilities for CISM in CESM (and ACME where appropriate) (B. Otto-Bliesner)

- development / testing / application of ice-ocean coupling using MPAS-O & MPAS-LI / CISM, in support of ACME (X. Asay-Davis; Martin talk)

Verification and Validation (V&V)

Verification for ice sheet models becoming standard (e.g. Evans SEWG talk)

Validation** for ice sheet models is far from standard because of:

Timescale: ice sheets typically react to climate forcing over 10^3-10^5 yrs but extensive observations of relevant fields (and rates of change) exist only for the past few decades (satellite era)

Sparse data: many observational datasets that might be useful for validation are often also needed as constraints for model optimization (e.g. surface velocities from InSAR)

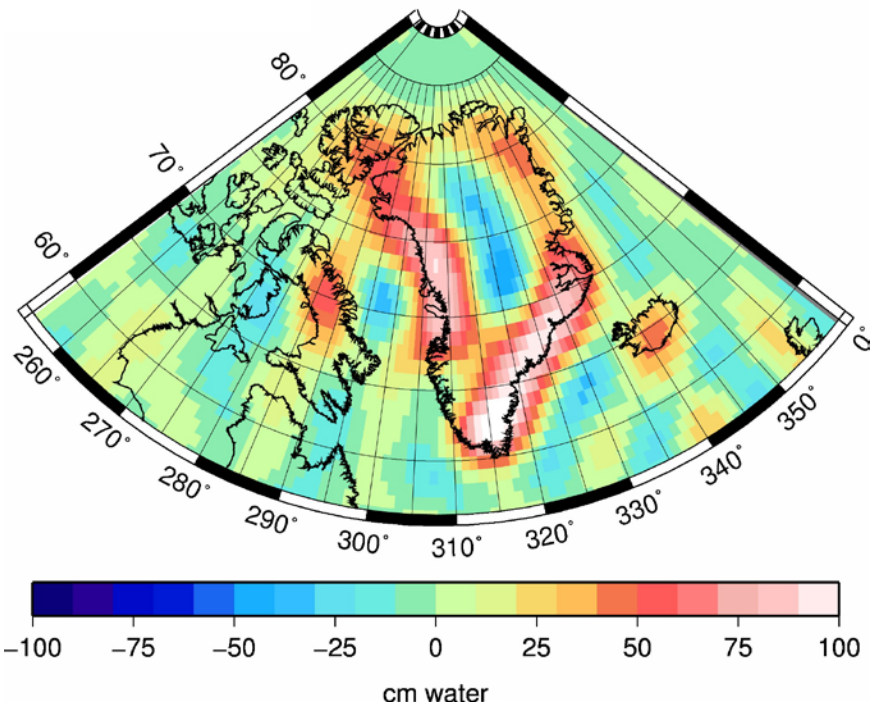
Data formats: many of the datasets that might be useful for validation are not yet in "model friendly" formats or involve processing / interpretation complications that require non-DOE expertise (e.g. ICESat, GRACE)

** **Validation**: Is our model is a good representation of the natural system we aim to mimic?

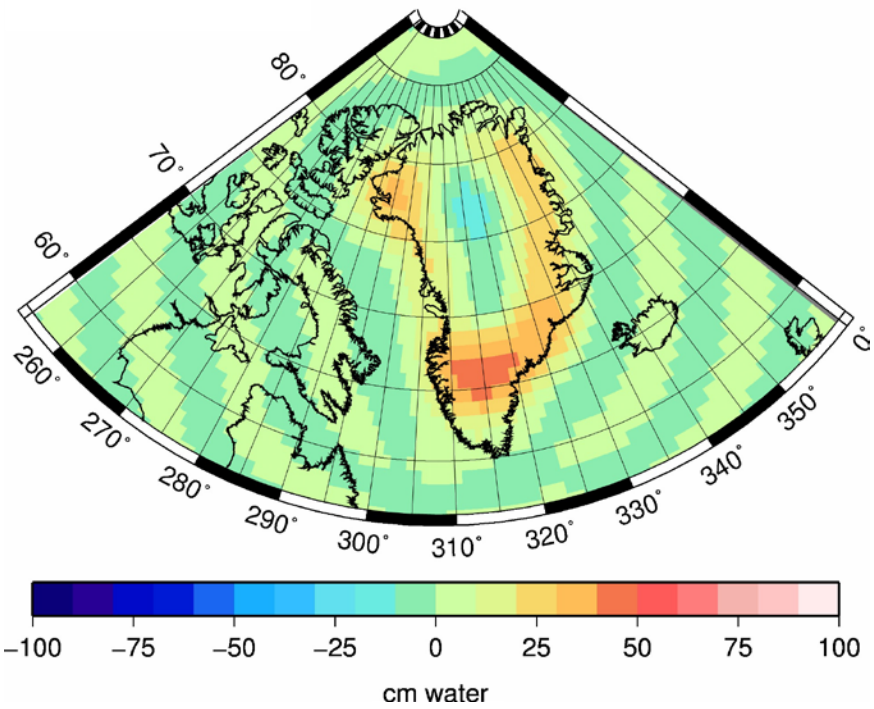
Verification: CISM vs GRACE

Greenland Ice Sheet mass change seen from GRACE satellite (2003-2013)

GRACE[1] in 60x60 harmonics (unsmoothed)



CISM simulation[2] converted to 60x60 harmonics

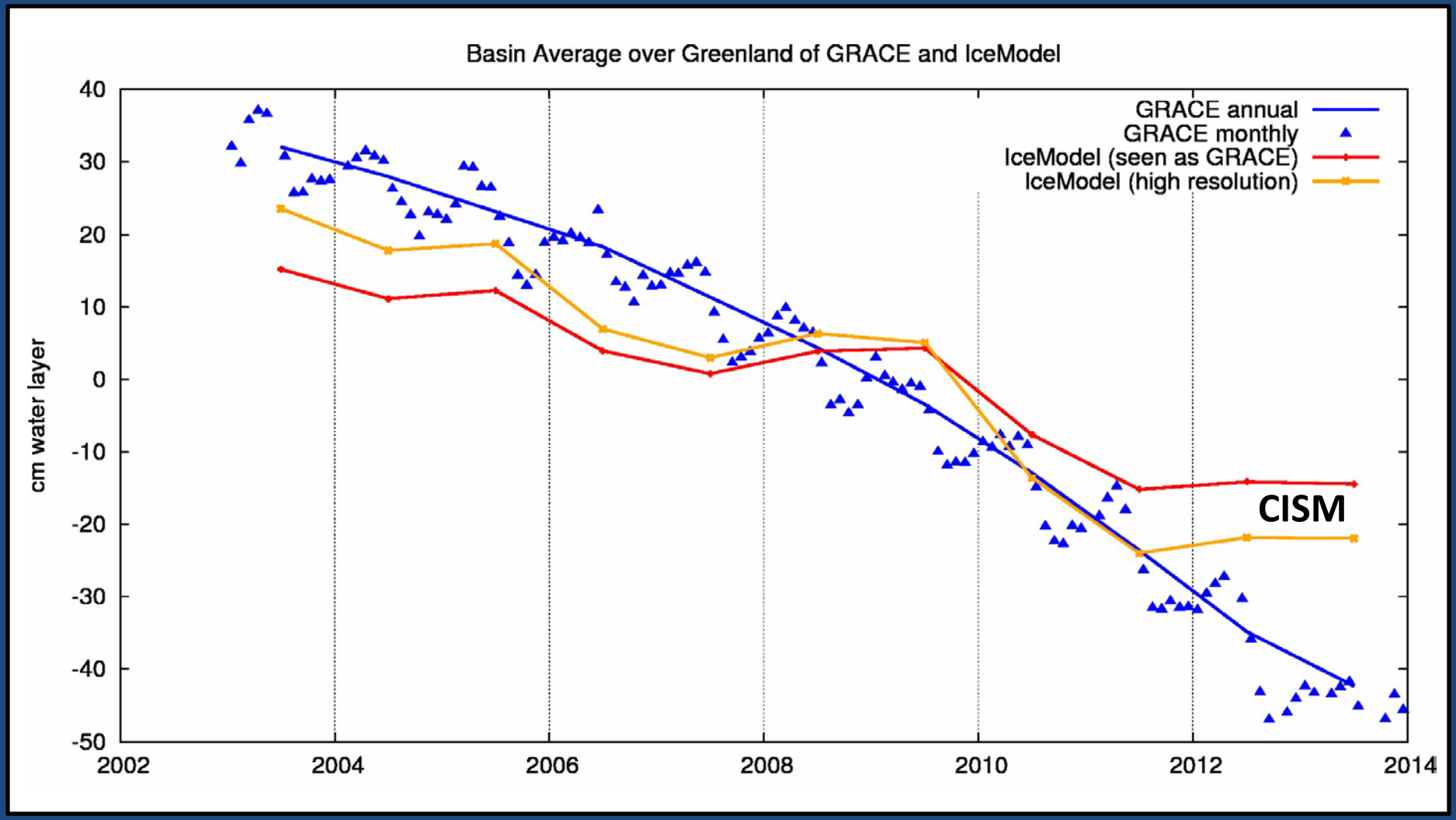


[1] processing and figures courtesy of J. Bonin & D. Chambers (USF)

[2] Shannon et al. (*PNAS*, 2013)

Verification: CISM vs GRACE

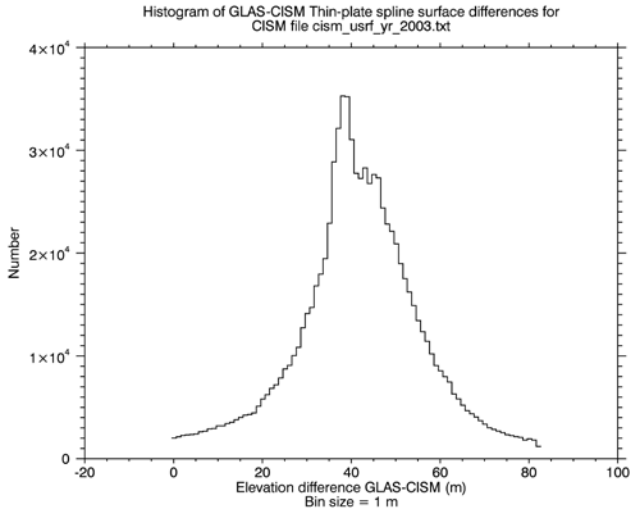
Greenland Ice Sheet mass change seen from GRACE satellite (2003-2013)

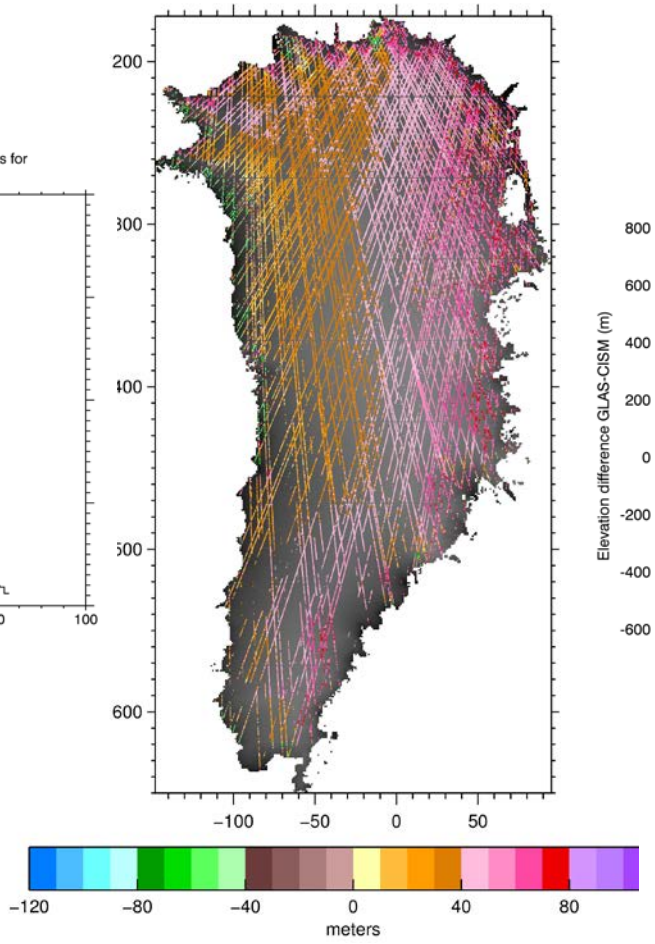


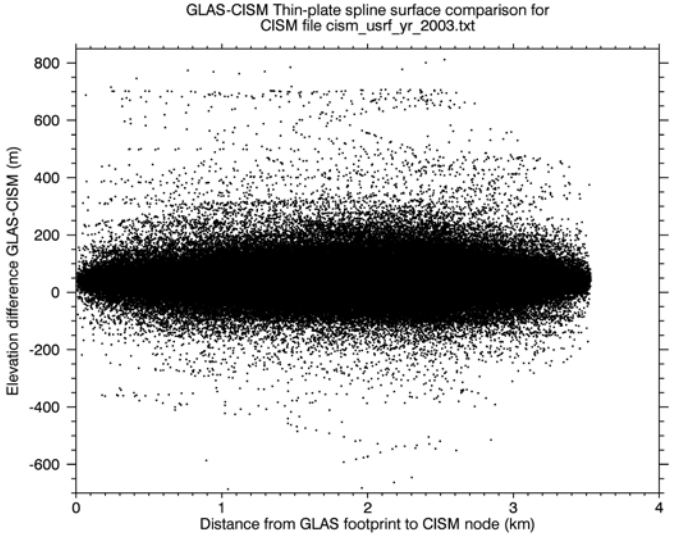
Verification: CISM vs ICESat

Greenland Ice Sheet elevation change seen from ICESat (2003)

ICESat[1] elevation minus CISM[2] elevation







[1] processing and figures courtesy of T. Neumann, J. Saba (NASA-GSFC)

[2] Shannon et al. (*PNAS*, 2013)