ASEP - Coordinated Modeling

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The Amundsen Sea basin is a compelling region for glaciological modelling. Ice dynamics here embraces a variety of ice flow styles and interactions with other components of ice sheet and climate systems. While the relevant issues are known, they have yet to be addressed in a thorough manner for predictive purposes. The IPY offers an ideal framework for such an effort. Issues that must be addressed by the ASEP modelling effort are summarized here.

Multi-physics coupling. Dynamical components of the Amundsen Sea region important to ice sheet mass balance include; grounded ice, ice streams, ice shelves, ocean circulation, tides, climate, sea ice, and grounding line treatments of ice. Each dynamical component is represented by a separate physical model. Coupling models, while upholding fundamental conservation laws such as conservation of energy, momentum, and mass will be constitute a major undertaking of this research.

Model Nesting. Each ice-dynamical component is characterized by distinct temporal and spatial scales. A second focus of model development will be the ability to nest model results in such a way that coarse scale runs provide essential inputs for finer scale runs, which have both improved resolution and more detailed physics.

Advanced treatment of basal conditions. This is a key focus of modern ice sheet model development and includes such topics as till fabric evolution and basal water flow. As there is a paucity of data relating to basal processes, generic formulations will be implemented, allowing a number of scenarios to be investigated quickly, and setting the stage for future efforts.

ASEP models will incorporate new data gathered by remote and ground-based operations conducted as part of the overall IPY effort. These data will be used to evaluate model performance and to drive models toward a present-day condition that will in turn form the basis for future-change simulations, including ice-sheet effects on sea level and ocean circulation.

The framework model presented in a separate EoI by Dr. Antony Payne is a logical platform for this effort although other options are possible. The framework would be extended in a manner that is consistent with the communal and collaborative nature of that work as part of the broader IGY internationalization and outreach efforts.