JRA-55 based surface data set for driving ocean-sea ice models (JRA55-do). Part I: Development and evaluation of surface atmospheric field and air-sea flux

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Framework of Coordinated Ocean-ice Reference Experiments (CORE) and the subsequent Ocean Model Intercomparison Project (OMIP) provides ocean and climate modelers with a common facility to perform hindcast simulations of the past ocean –sea-ice climate variability on interannual to decadal time scales. Given the success of this effort, requests to keep the forcing data set up to date would naturally emerge. This kind of framework should indeed provide opportunities to simulate recent climate extreme events, such as sea-ice reduction in the Arctic, global warming hiatus, and on-going El Nino / La Nina, and to understand them in the context of long-term variability. Unfortunately, it has been more than ten years since the current data set of this framework was first produced and it has not been kept up to date. New atmospheric reanalysis products with state-of-the-art technologies are now available. Some of the new satellite data products have now a duration long enough to be used as a reference data set for adjusting reanalysis products. There are also some concerns that the horizontal resolution (~ 200 km) of the current forcing data set based on the NCEP/NCAR reanalysis may not be suitable for simulations that use high (eddy permitting / resolving) horizontal resolution. This development study is an international collaborative effort to produce a new atmospheric data set for driving ocean –sea-ice models based on JRA-55 (Japanese Meteorological Agency, the Japanese 55-year Reanalysis), aiming to replace the existing forcing data sets.

JRA-55 is one of the most recently conducted long-term reanalysis using high resolution (~ 55 km) atmospheric model and updated assimilation techniques. The data set covers the period from 1958 to present and will be continued for forthcoming years. All atmospheric elements necessary for computing surface fluxes are based on the forecast mode of JRA-55. The temporal interval is 3 hours. Data are provided on the normal TL319 (~ 55 km) grid. Elements are downward short and long wave fluxes, precipitation (separated into rain and snow), 10-m vector wind, 10-m air temperature, and specific humidity (shifted from their original height at 2 m), and sea level pressure. Our preliminary evaluation indicates that JRA-55 also needs the same kind of adjustments (bias corrections) as was done in CORE for the NCEP/NCAR reanalysis and in DRAKKAR for the ECMWF reanalysis. Necessary adjustments are applied on all elements except for sea level pressure. Time dependent adjustments are considered if spurious features due to a specific transition in the assimilation method are identified. However, to provide data on near-real time basis, adjustment factors for the most recent period will be climatological. The forcing data set also includes daily river discharge produced by operationally running a river model forced by an adjusted land surface data of JRA-55. Runoff from Greenland and Antarctica is the climatology derived from independent estimates.

The presentation will introduce the new forcing data set based on the JRA-55 reanalysis and show general

features, adjustments methods, and comprehensive assessments of the latest version.