Prescribing sea-surface temperatures (SSTs) in atmosphere-only model simulations is known to produce erroneous relationships between SSTs, surface fluxes and precipitation. These errors cause biases in representations of the mean climate and its variability, particularly in the tropics. Simulations in which atmospheric models are coupled to dynamical ocean models, however, also suffer from biases when atmospheric-model errors feedback on the ocean, and vice versa. These biases inhibit sub-seasonal predictions and create uncertainty in regional climate-change projections.

In this seminar, I introduce a novel modelling framework, in which an atmospheric model is coupled to many columns of a one-dimensional mixed-layer ocean with high vertical resolution. This framework is a computationally efficient means of including air-sea interactions; it also easily permits a variety of sensitivity experiments, such as regional coupling in individual basins. Mean-state biases are limited by ocean temperature and salinity corrections, which can be adjusted to represent climatologies from observations or a conventional coupled model; the latter allows investigating the impact of regional SST biases in a coupled framework.

When this framework is applied to the Met Office Unified Model, air-sea coupling improves the propagation of the Madden-Julian oscillation, reduces tropical precipitation biases and improves European blocking frequency. These benefits are accomplished without changing the mean SST. I will also discuss plans for applying this framework to other GCMs, including the Super-Parameterized Community Atmospheric Model.

Link to colloquium videos and announcement page: http://www.atmos.colostate.edu/dept/colloquia.php