1135-65-288 **Jacob R Price*** (jrp14@uw.edu) and **Panos Stinis**. *Renormalized Reduced Order Models with Memory for Long Time Prediction.*

We examine the challenging problem of constructing reduced models for the long time prediction of systems where there is no timescale separation between the resolved and unresolved variables. In previous work we focused on the case where there was only transfer of activity (e.g. energy, mass) from the resolved to the unresolved variables. Here we investigate the much more difficult case where there is two-way transfer of activity between the resolved and unresolved variables. As in the previous cases, even if one starts with an exact formalism, like the Mori-Zwanzig (MZ) formalism, the constructed approximate reduced models can become unstable. We derive a new method of approximating the MZ formalism, and we show how to remedy the resultant stability problems by using dynamic information from the full system to renormalize the MZ reduced models. In addition to being stabilized, the renormalized models can be accurate for very long times. We use the Korteweg-de Vries equation to illustrate the approach. The coefficients of the renormalized models exhibit rich structure, including algebraic time dependence and incomplete similarity. (Received August 18, 2017)