1162-35-177 **Elizabeth A Carlson***, elizabeth.carlson@huskers.unl.edu, and **Adam Larios**, **Joshua Hudson**, **Luke Van Roekel**, **Humberto C Godinez** and **Mark Petersen**. *AOT Data Assimilation Algorithm: Parameter Recovery, Applications, and a Nonlinear Algorithm.*

One of the challenges of the accurate simulation of turbulent flows is that initial data is often incomplete. Data assimilation circumvents this issue by continually incorporating the observed data into the model. A new approach to data assimilation known as the Azouani-Olson-Titi (AOT) algorithm introduced a feedback control term to the 2D incompressible Navier-Stokes equations (NSE) in order to incorporate sparse measurements. The solution to the AOT algorithm applied to the 2D NSE was proven to converge exponentially to the true solution of the 2D NSE with respect to the given initial data. In this talk, we present our previous work on how the AOT algorithm applied to a system of equations with an incorrect parameter still converges to the correct solution up to an error determined by the error in the parameters, and how this led to the development of a simple parameter recovery algorithm. We will also present how this work led to the implementation of the AOT algorithm in the Model for Prediction Across Scales - Ocean model. Finally, in a different direction we also present a proof of the convergence of a nonlinear version of the AOT algorithm in the setting of the 2D NSE, where for a portion of time the convergence rate is proven to be double exponential. (Received August 31, 2020)