# A STOCHASTIC FRAMEWORK IMPLEMENTATION TO FORECAST STAGES IN THE EVERGLADES FOR OPERATIONAL PLANNING

***Yogesh P. Khare**, Alaa Ali[1], Walter Wilcox and Jason Godin*
South Florida Water Management District, West Palm Beach, FL, USA

Incorporation of predictive uncertainty in operational planning models used by water managers for decision making is of paramount importance. Understanding the response of water stages to anticipated rainfall is at the crux of choosing the optimal path forward in South Florida's complex Everglades ecosystem. Due to low skill of weather models in predicting precipitation on medium- to long-range timescales, projections are often made in terms of probabilities of above, below, and normal rainfall conditions (a.k.a., tercile probabilities) on seasonal scale. System wide simulation modeling tools, e.g., South Florida Water Management District Dynamic Position Analysis (DPA); rely on historical rainfall information to assess potential future stage trajectories over an annual timeframe, indirectly ignoring the forecasted precipitation pathway and stochastic nature of rainfall. Other planning tools (e.g., USGS's EverForecast) that incorporate rainfall projections make stage predictions that are not constrained by current operational practices.

Conditional Position Analysis (CPA), Ali 2017, relies on stage data generated with process-based model that incorporates current system operations during DPA and then stochastically generates the range of possible stage trajectories over the period of next 11 months for a given rainfall projection. This study implements CPA methodology at 200 locations encompassing the Everglades. While a range of hypothetical precipitation projection scenarios can be explored, a methodology that transforms El Niño-Southern Oscillation strength projections into rainfall tercile probabilities was developed specifically for CPA implementation. This framework first improves DPA stage data for known model biases and deviations in initial stages that occur as artifacts of DPA simulations. This stochastic framework, to be implemented monthly, would provide more reliable data to other ecological models that depend on hydrologic information. Also, this tool will provide a better perspective to decision makers about potential state of the Everglades system in medium-term to long-term future in the face of rainfall projections.

PRESENTER BIO: Dr. Khare is a systems data modeler with more than 10 years of experience in hydrologic and water quality modeling. He has published over 20 peer-reviewed journal articles. In his current role at South Florida Water Management District he focuses on developing and applying simulation models for operational planning.