Metadata for FCR Chla Forecasts EDI Publication

**Abstract**

Forecasts of bulk chlorophyll-a (ug/L) were produced for Falling Creek Reservoir, a small drinking water reservoir located in Vinton, Virginia in 2019 and 2020. Forecasts were made within a Bayesian framework using an autoregressive linear model. Forecasts were produced on a daily basis with a forecast horizon of 14 days, meaning forecasts were produced 14 days into the future from the day they were produced. We produced forecasts using three different models with different timesteps: a daily model, a weekly model, and a fortnightly model. Model drivers included shortwave radiation and discharge into the reservoir. All code to import data, calibrate models, and generate and analyze hindcasts are available on Github at https://github.com/wwoelmer/FLARE\_AR\_CHLA.

**Methods**

GENERATION OF CHLA FORECASTS: Detailed methods can be found in Woelmer et al. 20XX. Briefly, forecasts of near-surface (~1.0 m depth) chl-a at FCR were produced for ~600 days (from 2 January 2019 to 15 August 2020) using daily, weekly, and fortnightly autoregressive (AR) linear models developed using observational sensor data from FCR. For each forecast, model driver and validation data were automatically collected via automated sensors at the study site and wirelessly uploaded to an online data repository using secure sensor gateways. At each model time step, new data were appended to the historical training dataset, and used to re-parameterize the AR models. Forecasted model driver data included shortwave radiation and forecasted discharge to the reservoir from the major inflow. Shortwave forecasts were automatically downloaded from the National Atmospheric and Oceanic Administration Global Ensemble Forecasts System (NOAA GEFS) repository. Forecasts of future discharge were modeled using both sensor discharge measurements on the inflow at FCR and NOAA forecasted precipitation as inputs (see Thomas et al. 2020 for more details). Uncertainty was propagated for four different uncertainty types (process, initial condition, parameter, and driver data).

We generated probabilistic daily forecasts which had a 1-day, 2-day, 3-day... up to 14-day time horizon, weekly forecasts which had a 1-week and 2-week (i.e., 7-day and 14-day) time horizon, and fortnightly forecasts which had a 2-week time horizon. To develop and run our forecast models, we used a combination of linear parametric and Bayesian statistical methods. We used parametric linear model selection on historical data to pick model covariates and starting parameter values. To produce forecasts, we applied our model in a Bayesian framework. All forecast output is published in this data product.

NAMING CONVENTION FOR HINDCAST FILES: Within the provided .zip folders, we have included forecast output for all three models under all uncertainty modes (forecast\_output\_EDI), parameter output for all three models under uncertainty mode 1 (parameter\_output\_EDI), and null persistence forecast output (null\_model\_EDI). We also provide three example files, one for each file type contained in the three zipped folders.

Naming convention for each .csv file is as follows:

The forecast\_output\_EDI folder includes files following the convention:  
YYYY\_MM\_DD\_chla\_TIMESTEP\_UNCERTMODE.csv

The parameter\_output\_EDI folder includes files following the convention:  
YYYY\_MM\_DD\_ensemble\_parameters\_TIMESTEP\_UNCERTMODE.csv

The null\_model\_EDI folder includes files following the convention:  
YYYY\_MM\_DD\_null\_summary\_TIMESTEP.csv

TIMESTEP = 1day, 7day, or 14day depending on the timestep of the model used to make the forecast

And UNCERTMODES are

1 = all uncertainty   
2 = only process uncertainty   
3 = only weather driver uncertainty  
4 = only initial condition uncertainty  
5 = only parameter uncertainty  
6 = only discharge driver uncertainty

CITATIONS: Thomas, R.Q, R.J. Figueiredo, V. Daneshmand, B.J. Bookout, L. Puckett, and **C.C. Carey**. 2020. A near-term iterative forecasting system successfully predicts reservoir hydrodynamics and partitions uncertainty. In press at Water Resources Research. DOI: [10.1029/2019WR026138](http://resolver.ebscohost.com/openurl?url_ver=Z39.88-2004&rft_val_fmt=info:ofi/fmt:kev:mtx:journal&__char_set=utf8&rft_id=info:doi/10.1029/2019WR026138&rfr_id=info:sid/libx%3Avirginiatech&rft.genre=article)

**Additional Information**

ANYTHING NEEDED HERE?

Keywords

Carey Lab, Virginia Tech, lake, lakes, reservoir, reservoirs, water quality, chlorophyll a, Western Virginia Water Authority, Falling Creek Reservoir, fluorescence, forecast, hindcast, historical monitoring, resource management, phytoplankton, near-term

**Personnel**

Link to personnel file in the repo

**Attributes** (one table for each file)

Link to the attributes files in the repo