

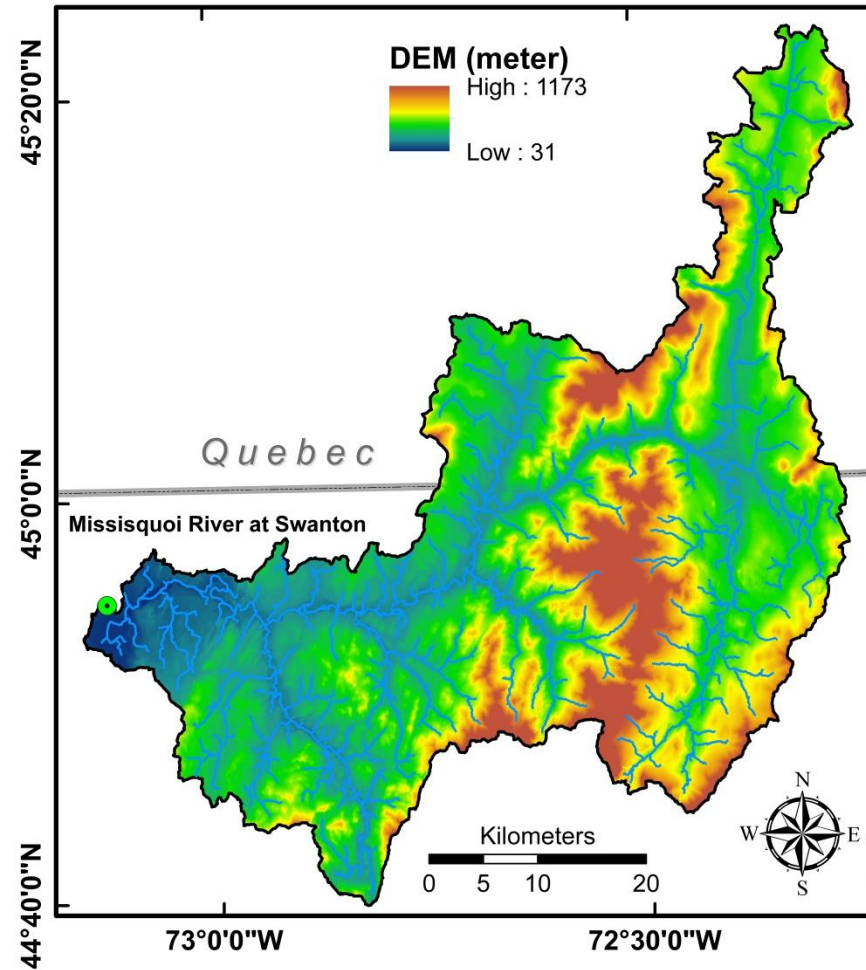
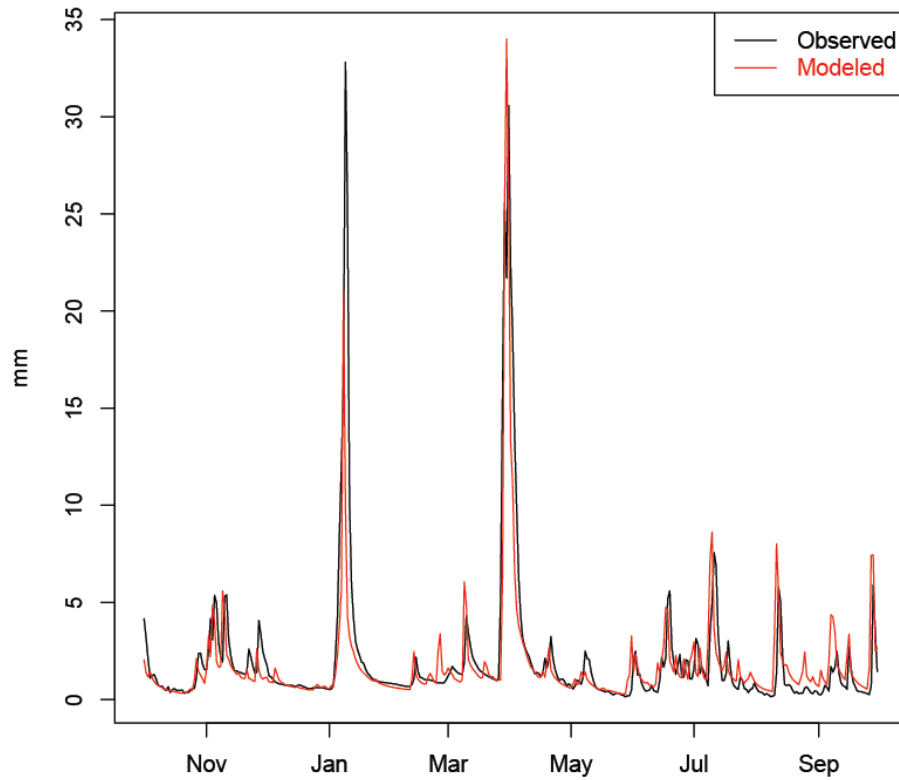


Missisquoi Bay

St Albans Bay

Missisquoi Model: a key component of integrated model

1997-1998 Water Year Observed and Simulated Runoff



Model selection:

Missisquoi: Rhessys model (from RACC project)

St Albans: HSPF model (for BREE project)
SWMM model (for BREE project)

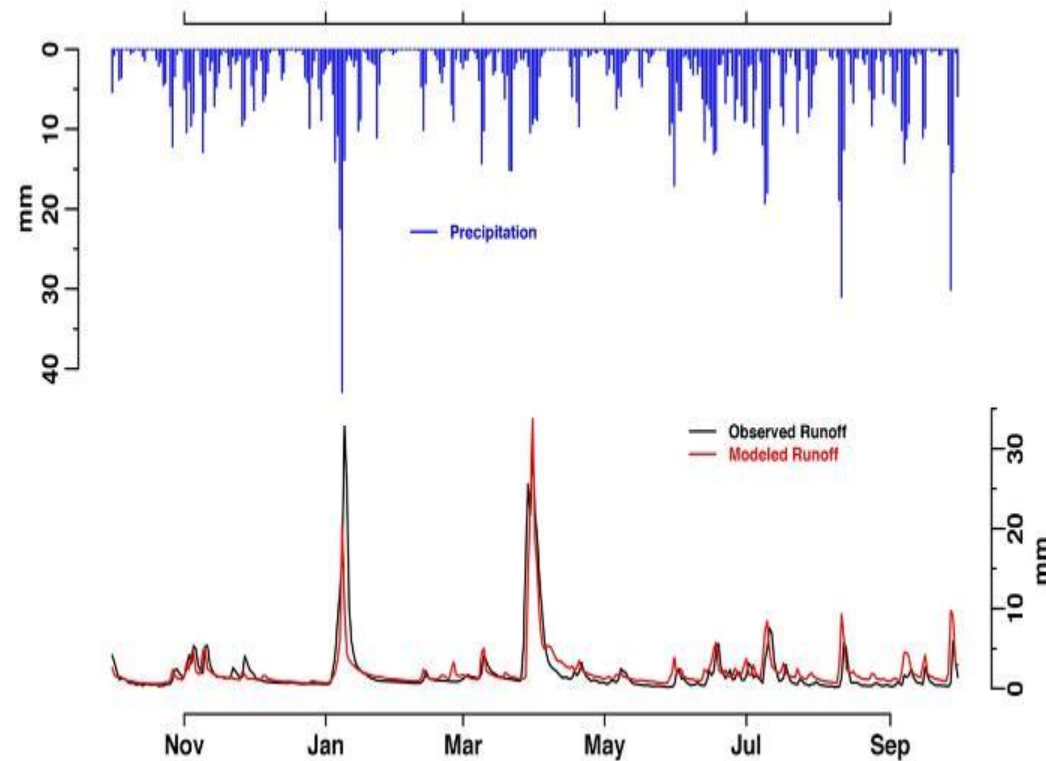


In EPA BASINS model suite;
easy model interaction

Modeling goals:

1. simulate the phosphorus loading into each bay
2. model the behavior of soil moisture and snowpack under a changing climate in order to
3. represent the translation of climate signals into flow signals
4. simulate the adoption of urban AND agricultural BMPs and their impact on P loading
5. provide key model components for the integrated assessment model

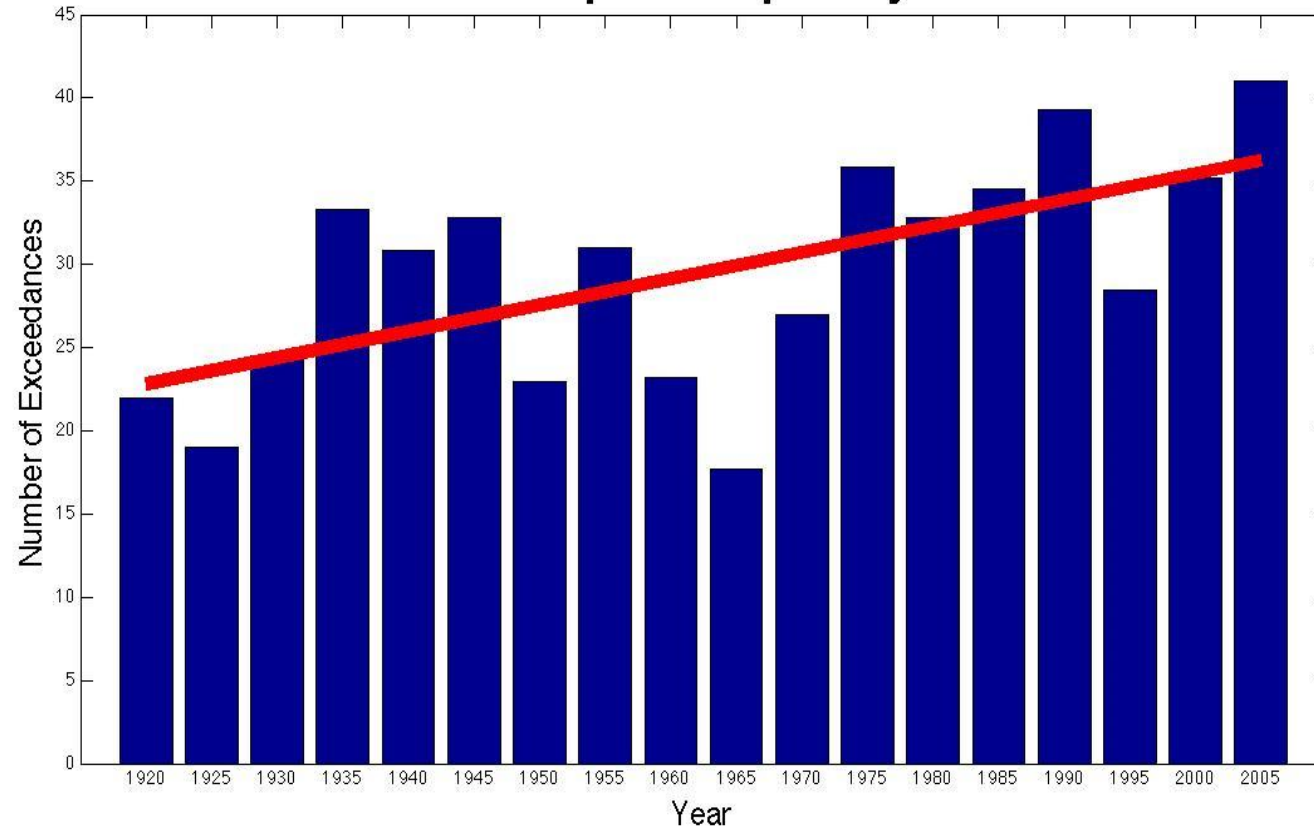
Missisquoi model Calibration



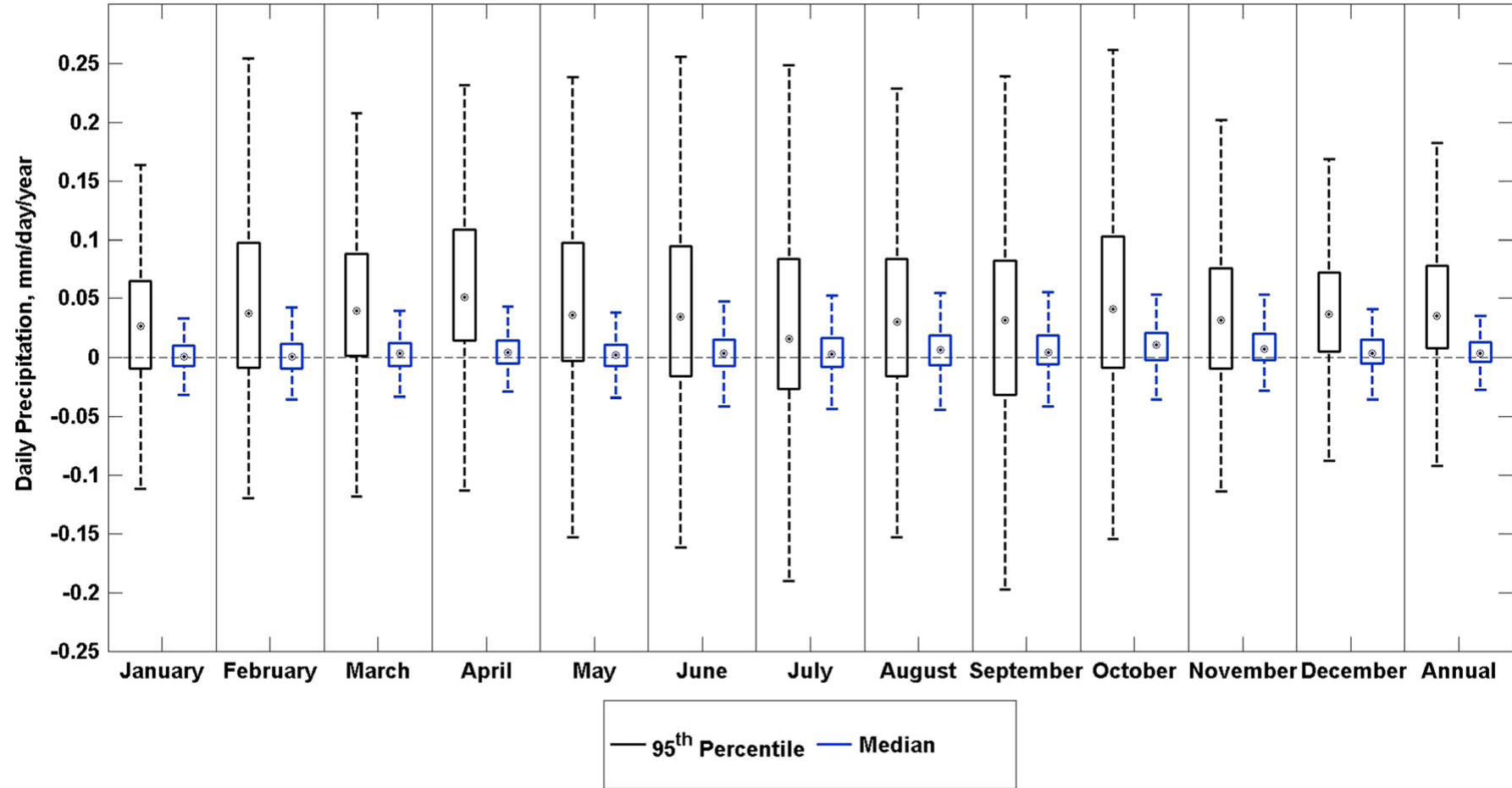
Daily simulated (red line) and observed (black line) runoff during the 1998 water year (Oct–Sep) for the Missisquoi River watershed at the USGS streamflow gauge # 04294000. Blue lines on the top give daily precipitation values aggregated over the Missisquoi watershed during the 1998 water year.

Climate drivers: precipitation is becoming more extreme in Vermont

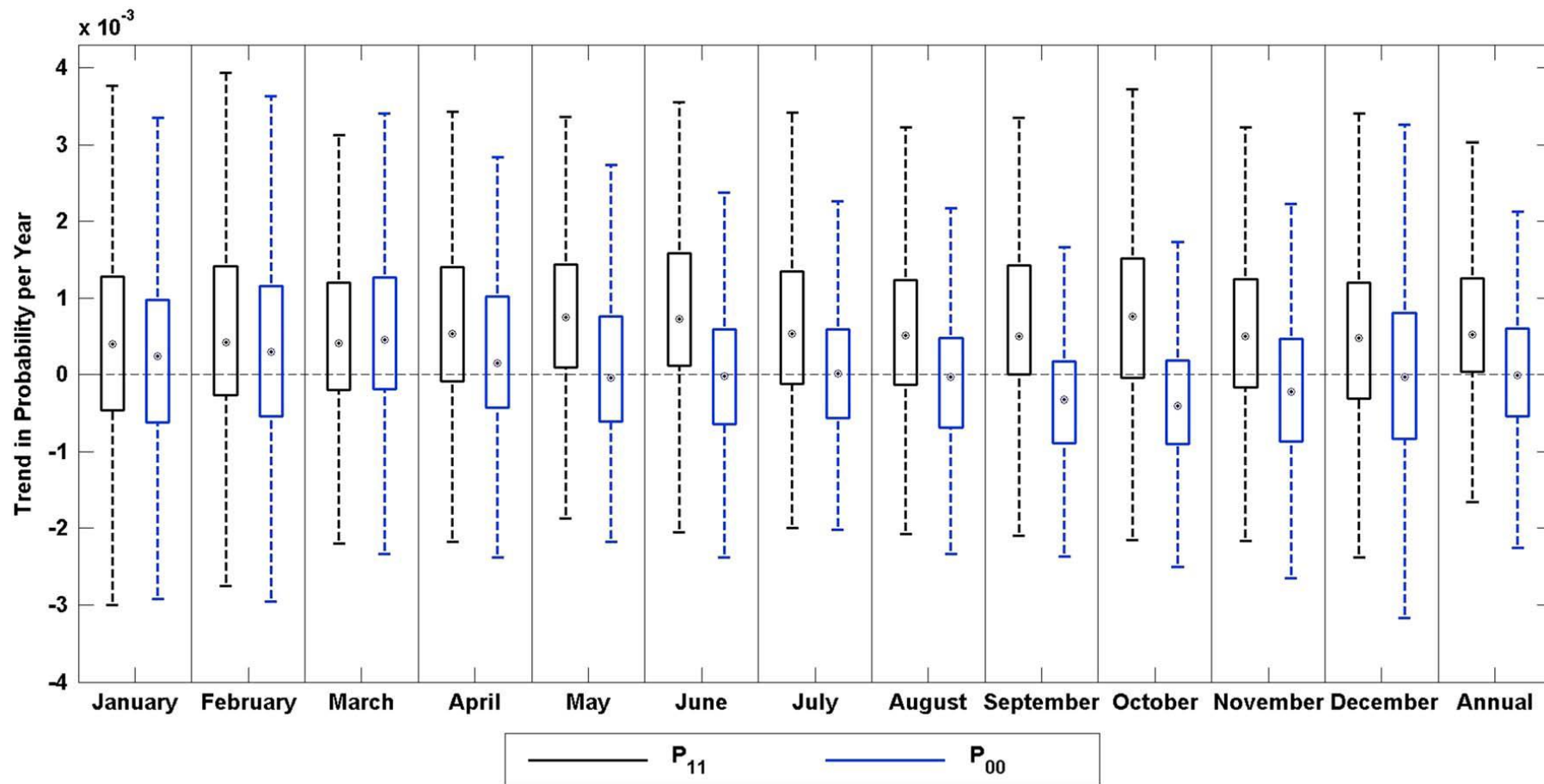
Average Exceedences of 1in of Precipitation per 5-years



Precipitation trends over all northeast meteorological stations (USHCN)



Trends in Markov Chain parameters show increased precipitation persistence in Northeastern US



ERA5 Overview

- **ECMWF: 2016 model, in production**
- **1979-present (by 2018 have 40yrs)**
 - **2010-2016 available next quarter (JJA)**
 - **Remainder by spring 2018**
- **High space and time resolution**
 - **Spatial: 0.25° x 0.25°**
 - **Temporal: hourly**
 - **Vertical: 137 levels**
- **Analyze events; regional precipitation**
 - **boundary conditions for WRF**

Limited GCM use for extremes analysis without additional steps: results from delta method for statistical downscaling

