

Simulation of Lake Erie Ice

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Abstract

A Great Lakes Ice-circulation Model (GLIM) was applied to Lake Erie during 2009-2010. Hourly surface wind stress and thermodynamic variables derived from measurements are interpolated onto the 2-km grid used for forcing. The seasonal variations for sea ice concentration and thickness are simulated in the ice season. Satellite measurements of surface water temperature and ice cover, and ice thickness measured using a helicopter was used to verify GLIM. The annual cycle for the lake surface temperature is well modeled. A series of sensitivity experiments to test some coefficients impacts on ice simulation.

1. Model Verifications

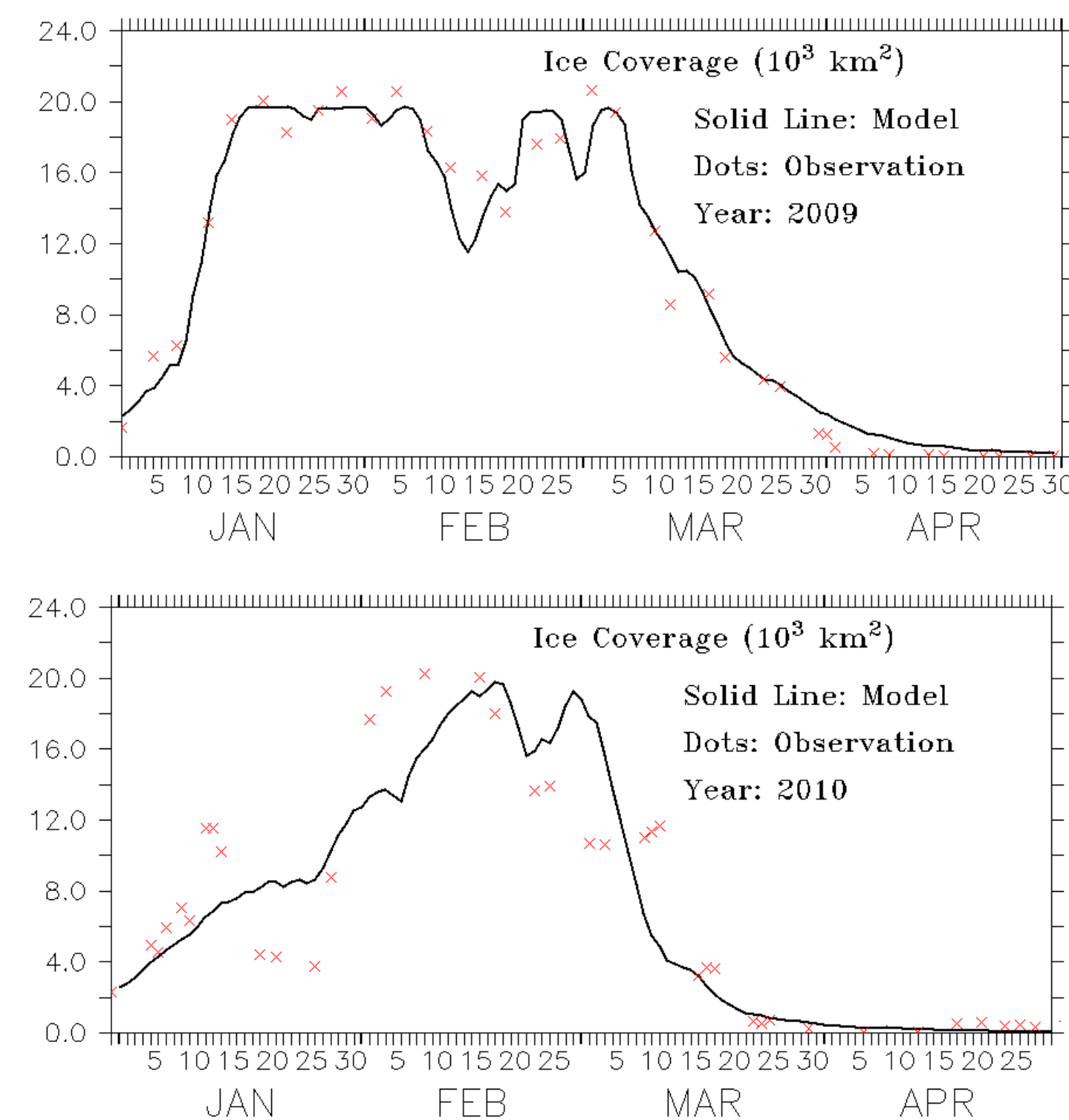


Figure 1. Simulated ice covers are compared to satellite observations.

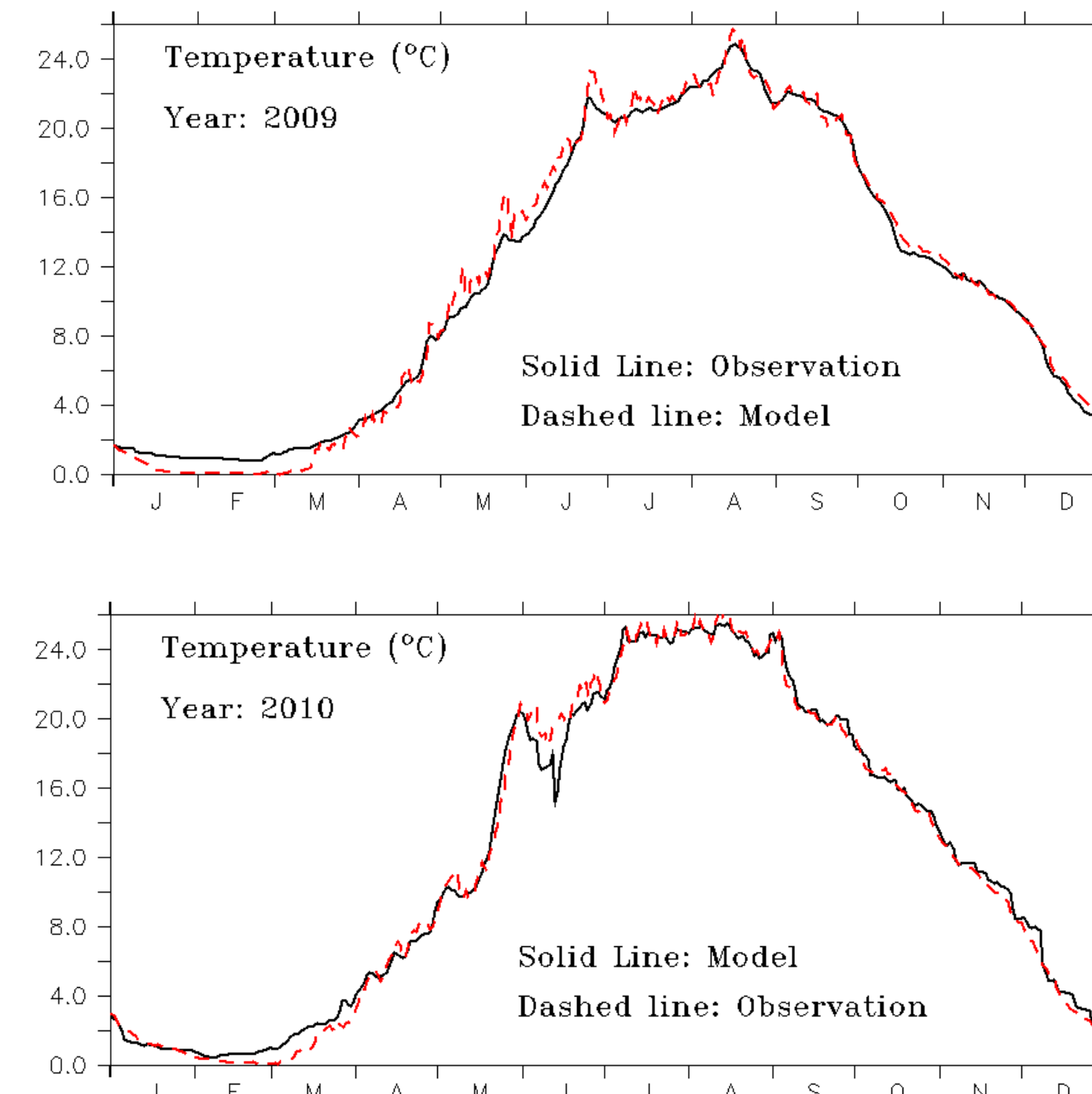


Figure 2. Simulated surface temperature and observation.

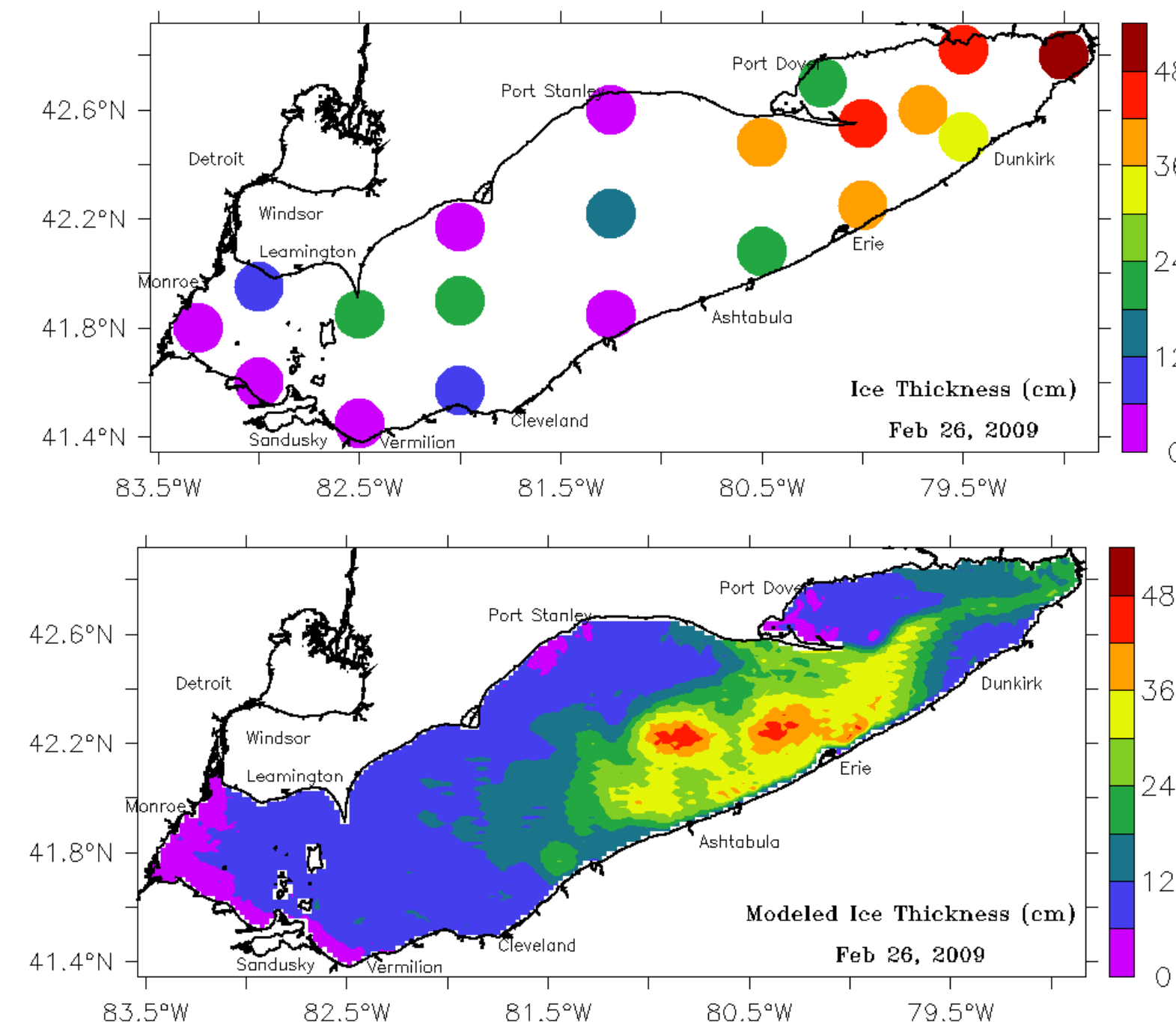


Figure 3. Simulated ice thickness is compared to observations using helicopter.

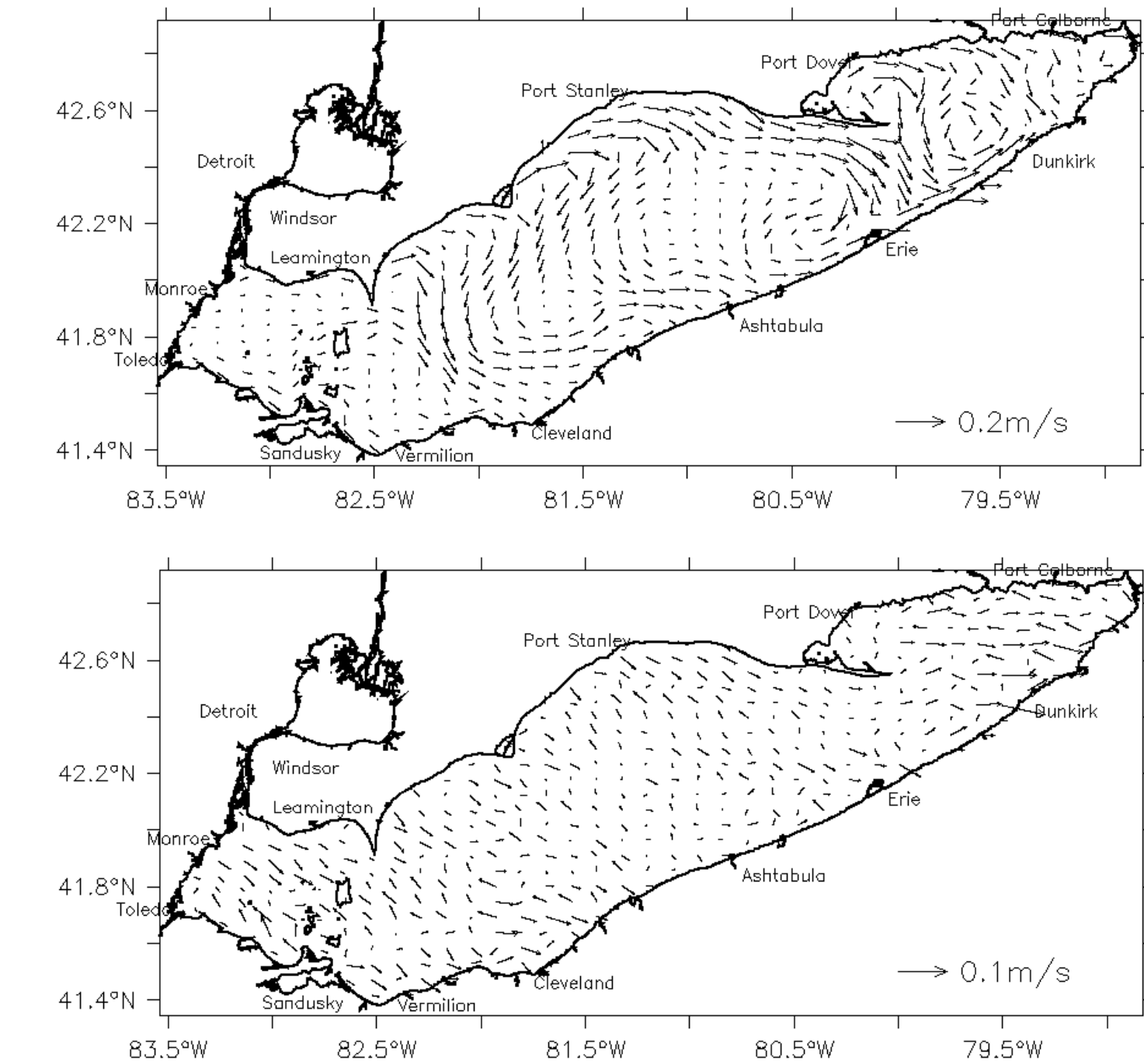


Figure 4. Simulated surface circulations. Upper panel: August; lower panel: February.

2. Sensitivity study

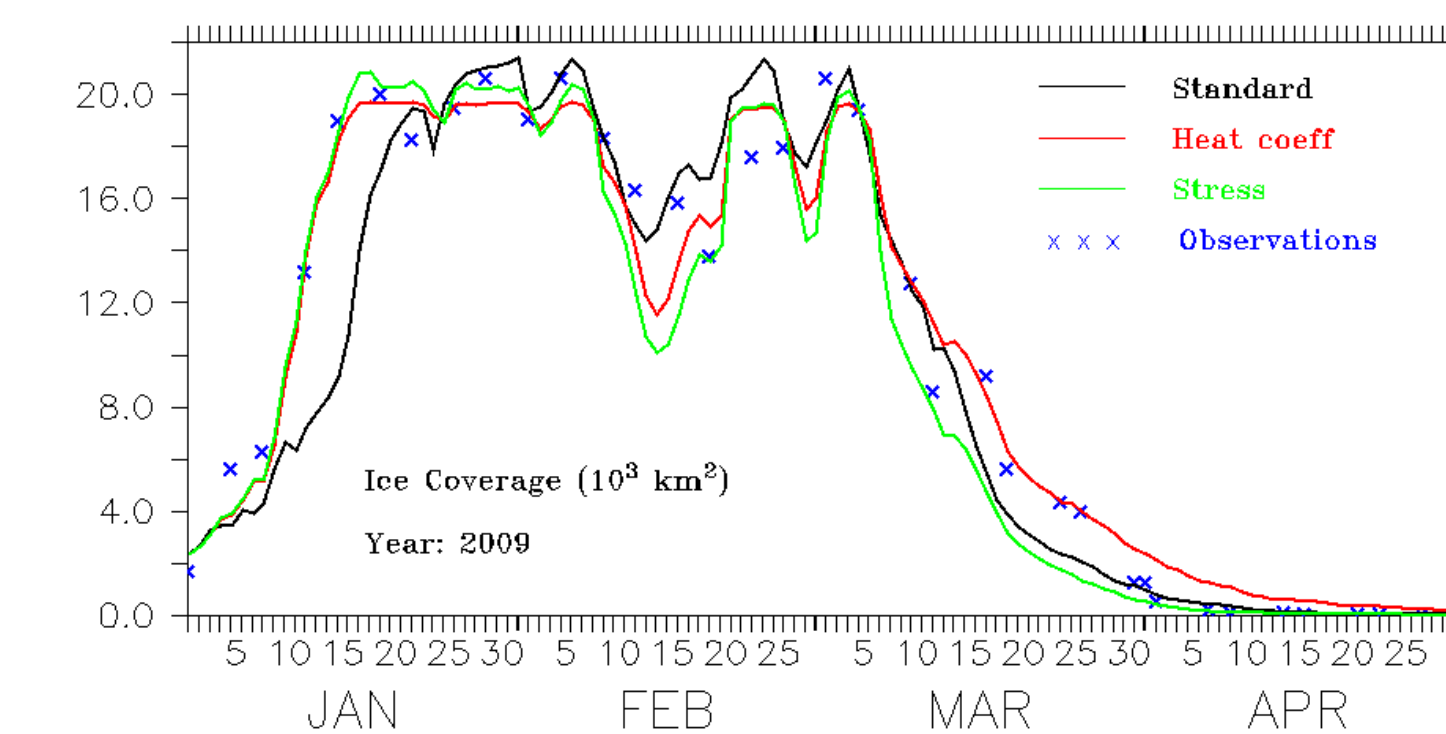


Figure 5. Sensitivity study a. Test some heat transfer coefficients
b. Test decoupled wind-ice-water stress

Reference

Wang, J, H. Hu, D. Schwab, G. Leshkevich, D. Beletsky, N. Hawley, and A. Clides. Development of the Great Lakes Ice-circulation Model (GLIM): Application to Lake Erie in 2003-2004, J. Great Lakes Res. 36, 425-436, 2010. doi:10.1016/j.jglr.2010.04.002

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