The Mississippi River Void



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LABORATORY

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Bottom Line Up Front (BLUF):

- 1. Fresh water stratification inhibits vertical momentum mixing resulting in high transport in MS River plume
- 2. Convergence processes at fresh water front hold material
- 3. Incoming material is also held in the fresh water front
- 4. GOOD: MS River plume is naturally cleaned
- 5. BAD: Concentration of bad material at front
- 6. GOOD: Focus cleanup efforts



- The distance moved in 24 hours is up to 100 km, which is bit more than 1 m/s – sustained – for 24 hours
- 24 hour drift trajectories ending at Feb 25, 00 GMT



1 km horizontal resolution, 34 sigma over 16 Z layers, surface layer max thickness is 0.5 m

Large river flow and wind events

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-Wind forcing events-

-River outflow, high stratification-

Is it the winds, or is it the river flow?



Surrounding areas

Areas of fresh surface (< 34 PSU) and shallow mixed layer (< 20 m)

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Model response to January 22 wind event shows surface speeds in fresh water areas are much higher than those in other areas.

Surface speed response is faster in fresh water plume



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Jan 22, 2016 09 GMT



Jan 22, 2016 09 GMT Stronger surface currents in fresh water than saline water

Modeled and observed vertical shear





Modeled and observed stratification



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Stommel, H. (1993), A conjectural regulating mechanism for determining the thermohaline structure of the oceanic mixed layer, *J Phys Oceanogr*, 23(1), 142-148.

Soloviev, A. V., S. Matt, and A. Fujimura (2015), Three-dimensional dynamics of freshwater lenses in the ocean's near-surface layer, Oceanography, 28(1), 142-149.

Open gate example



Initially closed gate

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Return to open gate



Observing the convergence



A large wind event would not be expected to organize



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The ocean and wind have organized surface material

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SCOPE – an explanation





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