Vector Field Analysis and Visualization with **Robustness**

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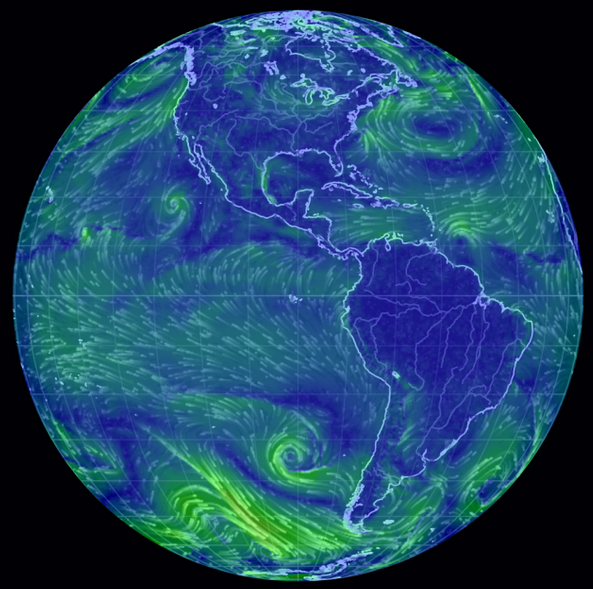
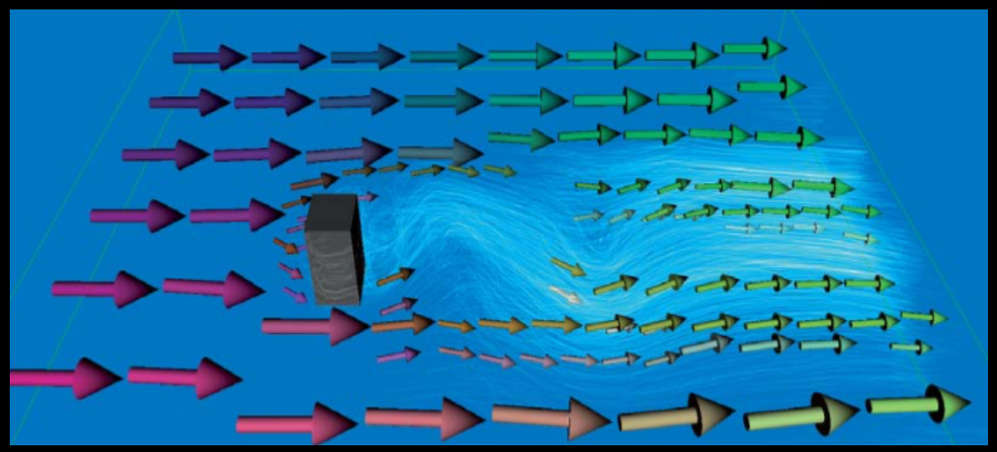
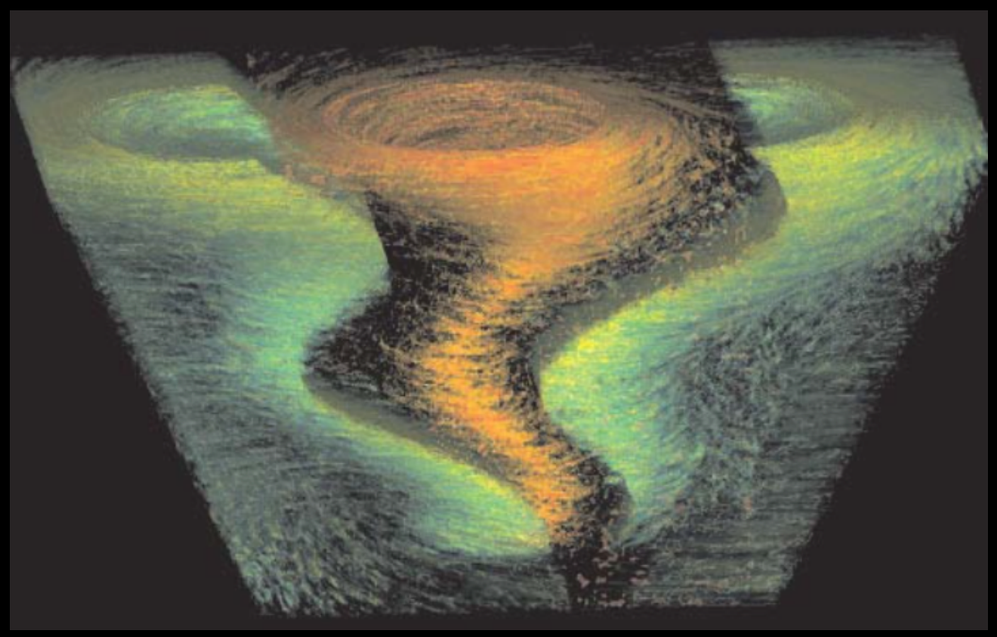
School of Computing, SCI Institute
University of Utah

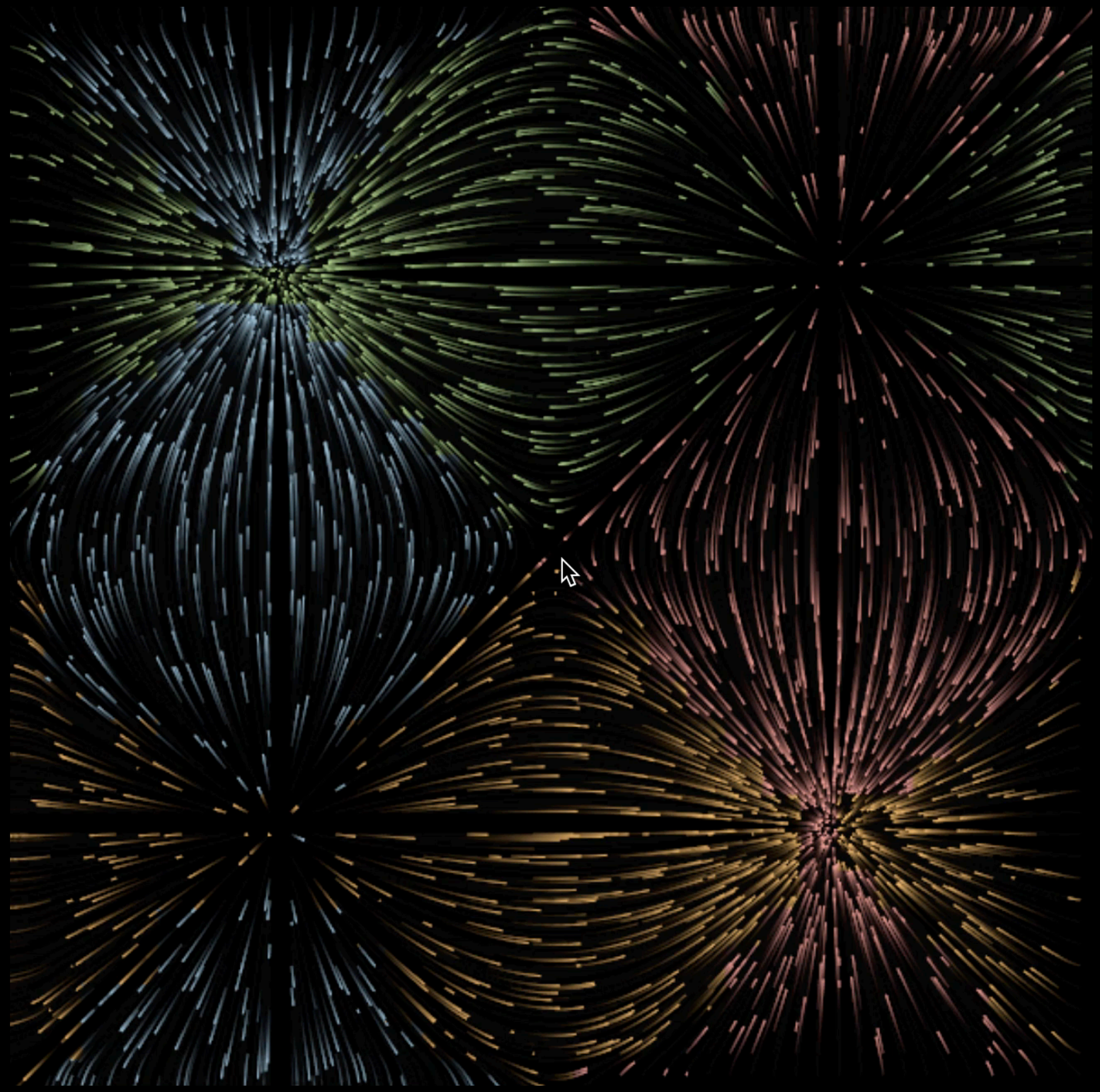
The Teaser Story

Make the flow patterns visible & Interpretable





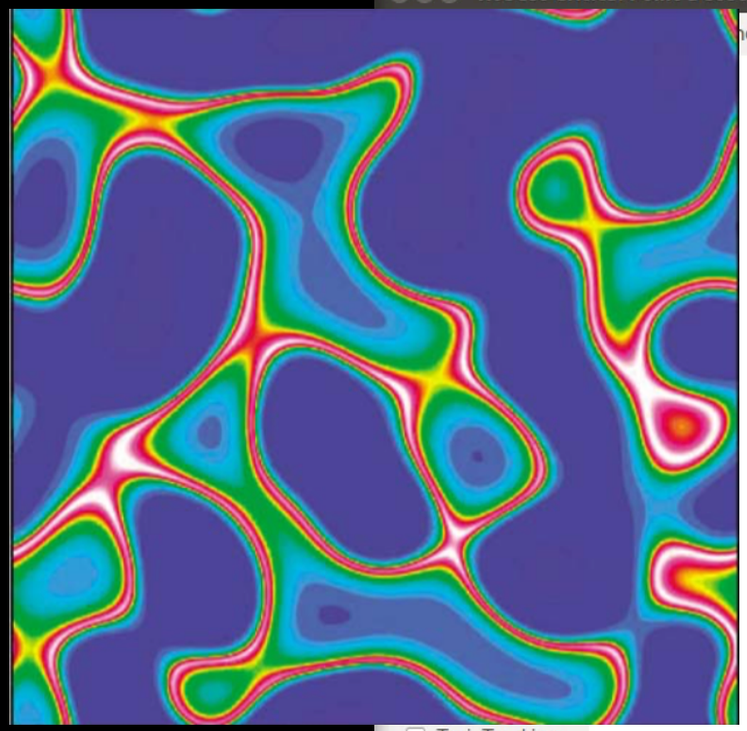


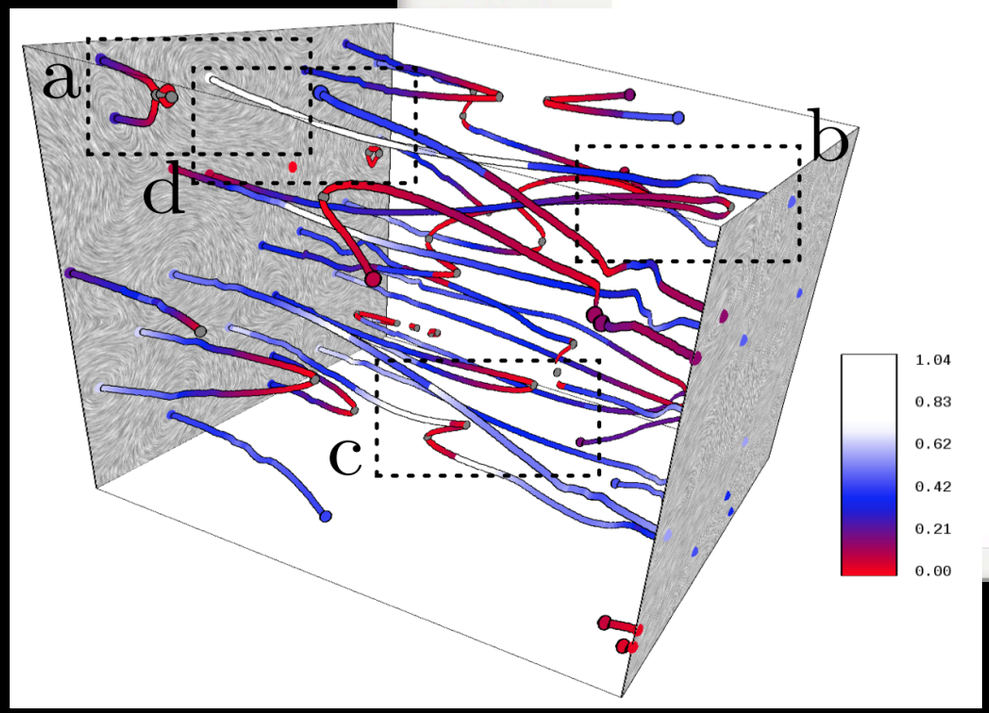


Sources: Dan Maljovec, Cameron Beccario, [Correa, Silver, Chen 2007]
[Burger, Kondratieva, Kruger, Westermann 2008]

Quantify feature stability

Video: http://www.sci.utah.edu/~beiwang/publications/EuroVis_Vector_Robustness.mov

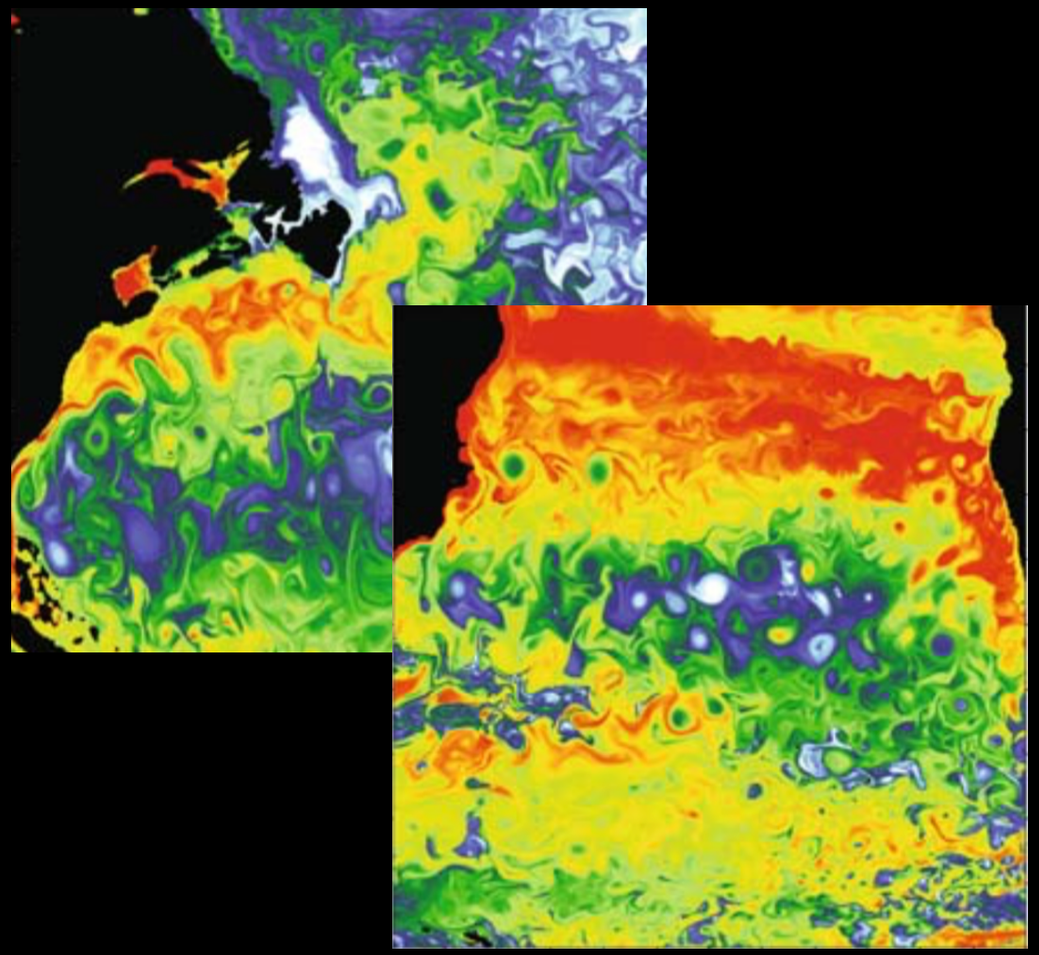


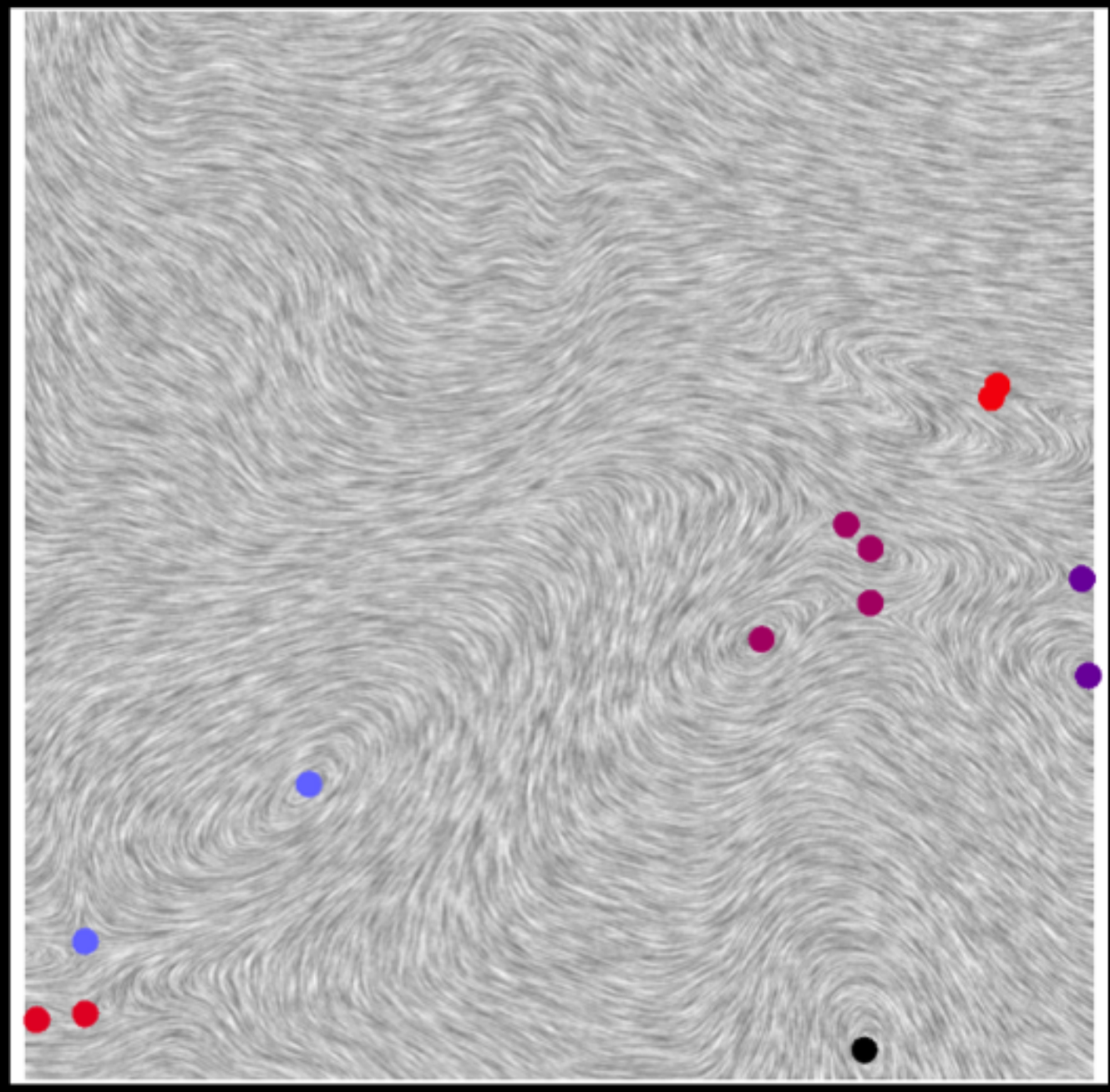


Combustion Simulation

Simulation: [Hawkes, Sankaran, Pebay, Chen 2006]

Separate features from noise at multi-scale





Ocean Eddy Simulation

Map: Courtesy of SlidesCarnival & Unsplash
Simulation: [Maltrud, Bryan, Peacock 2010]

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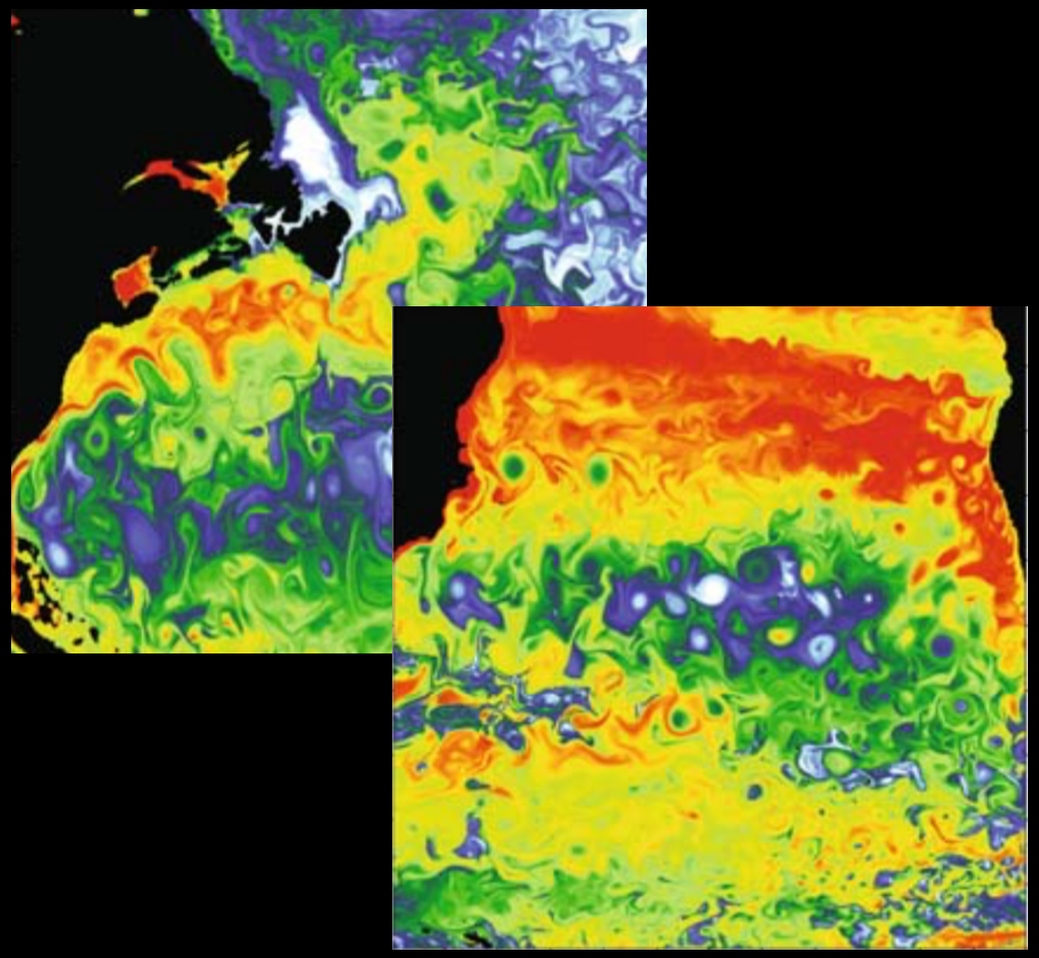

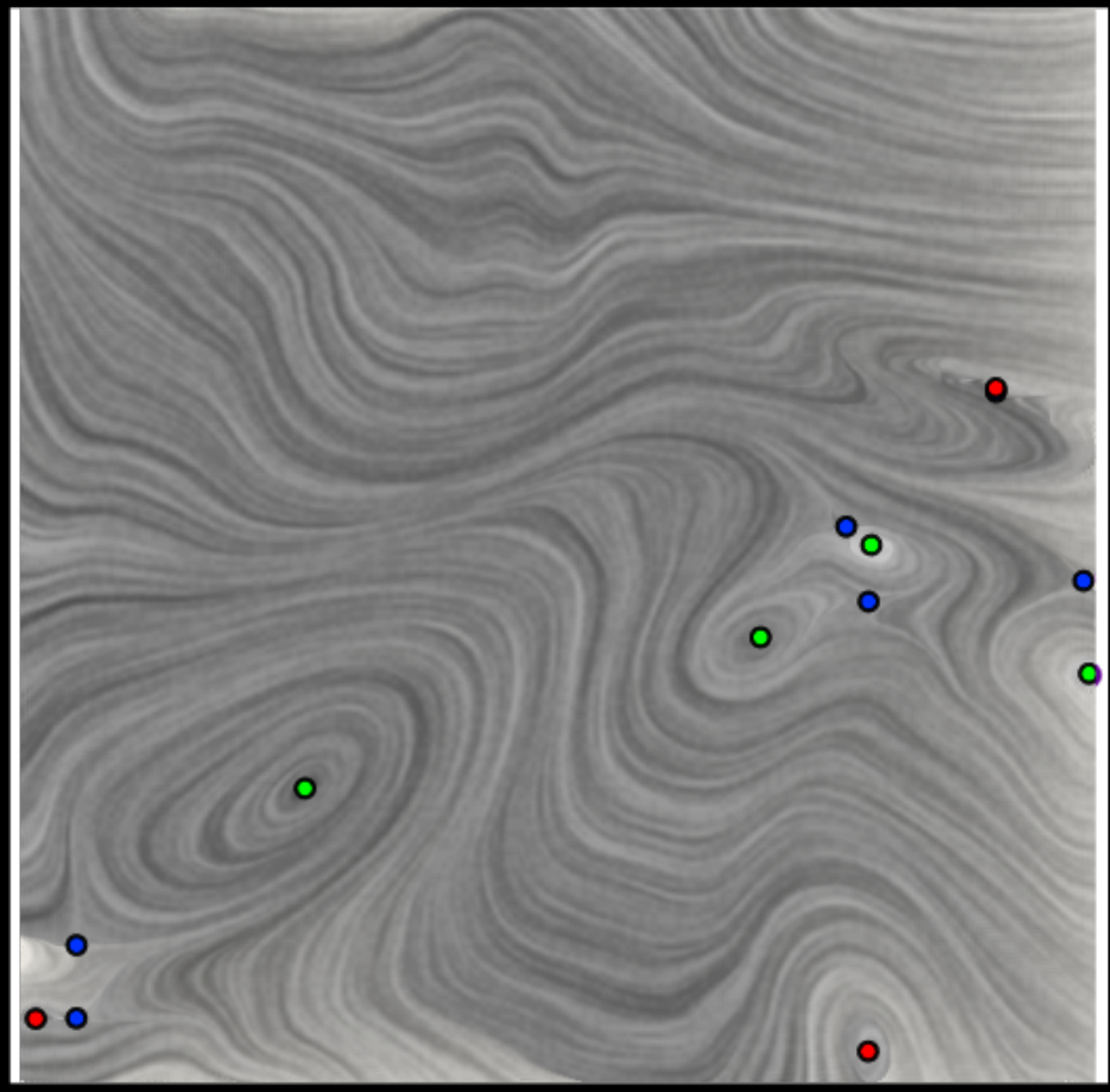

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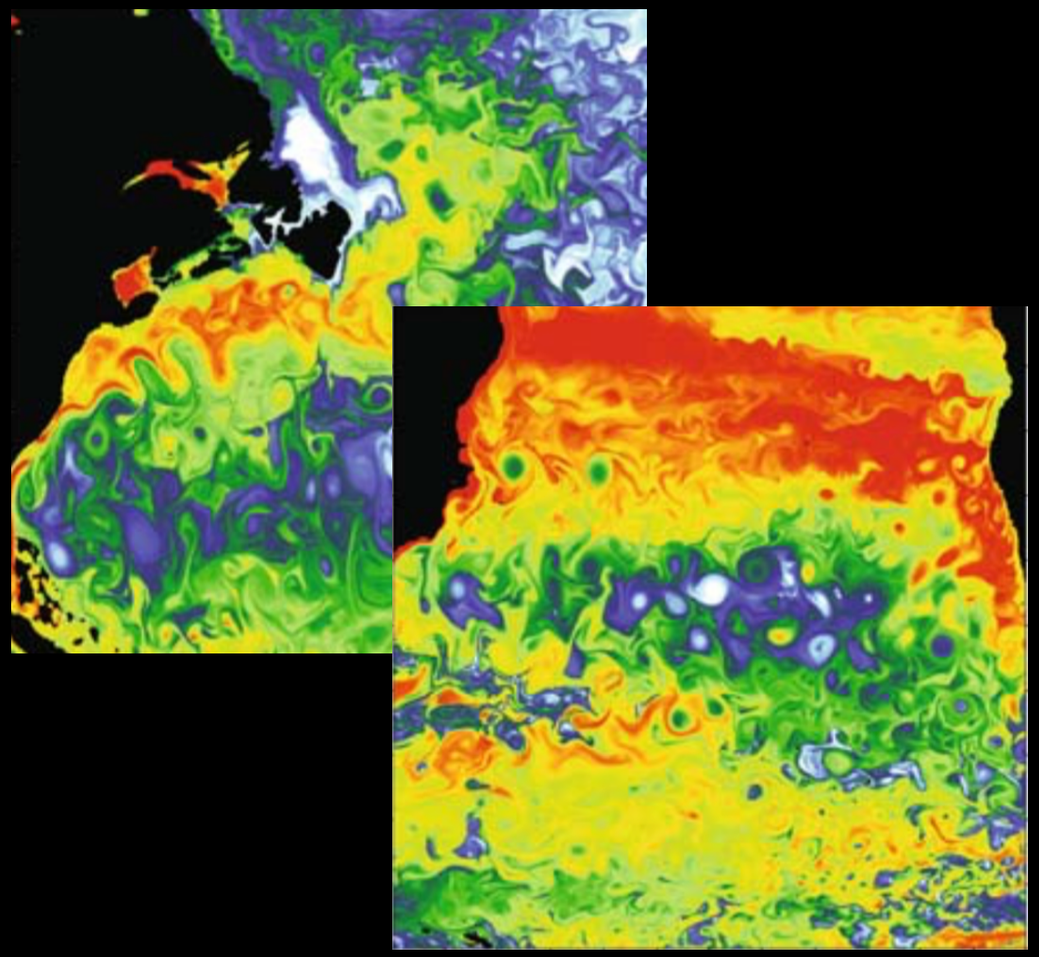

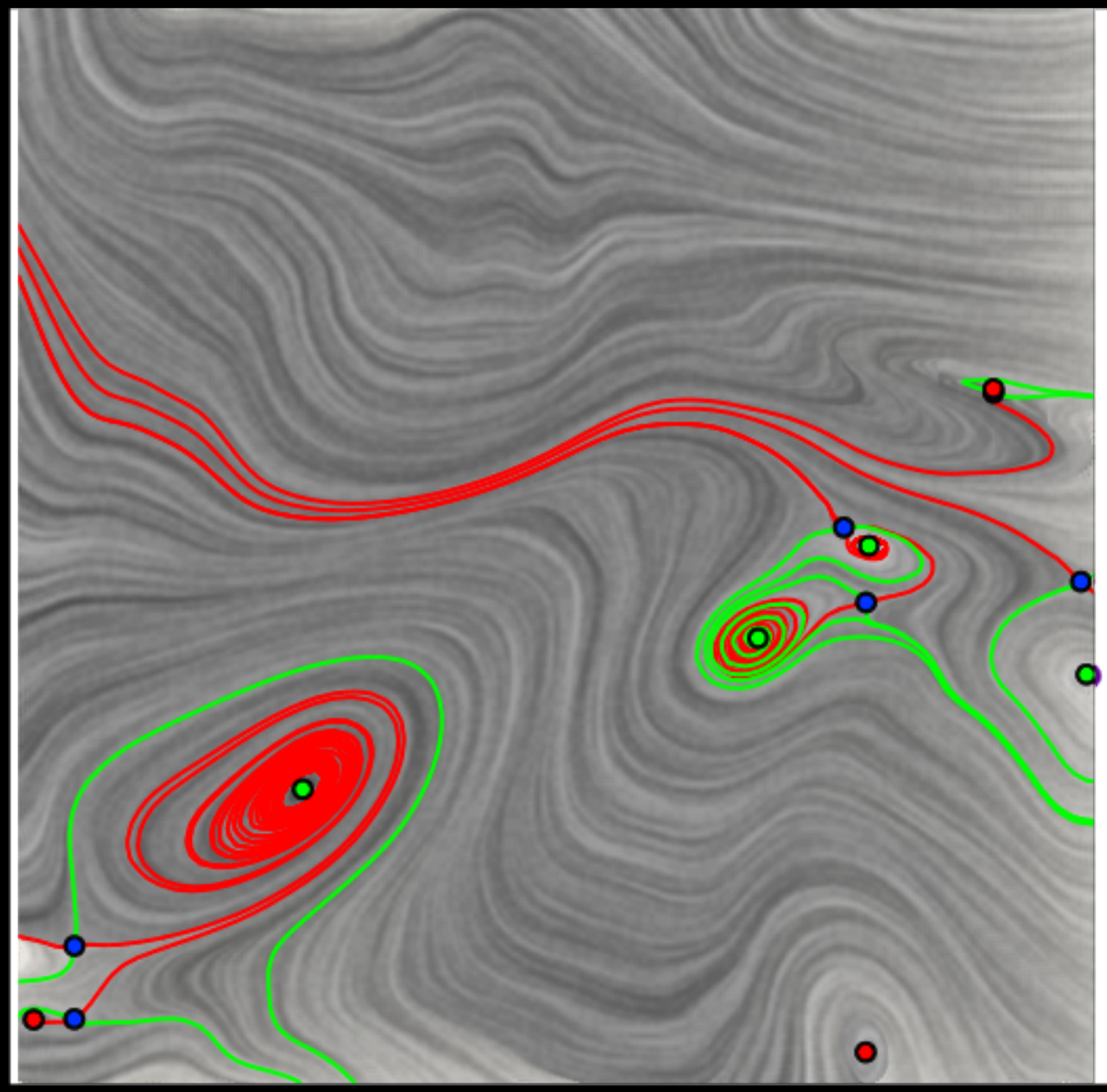

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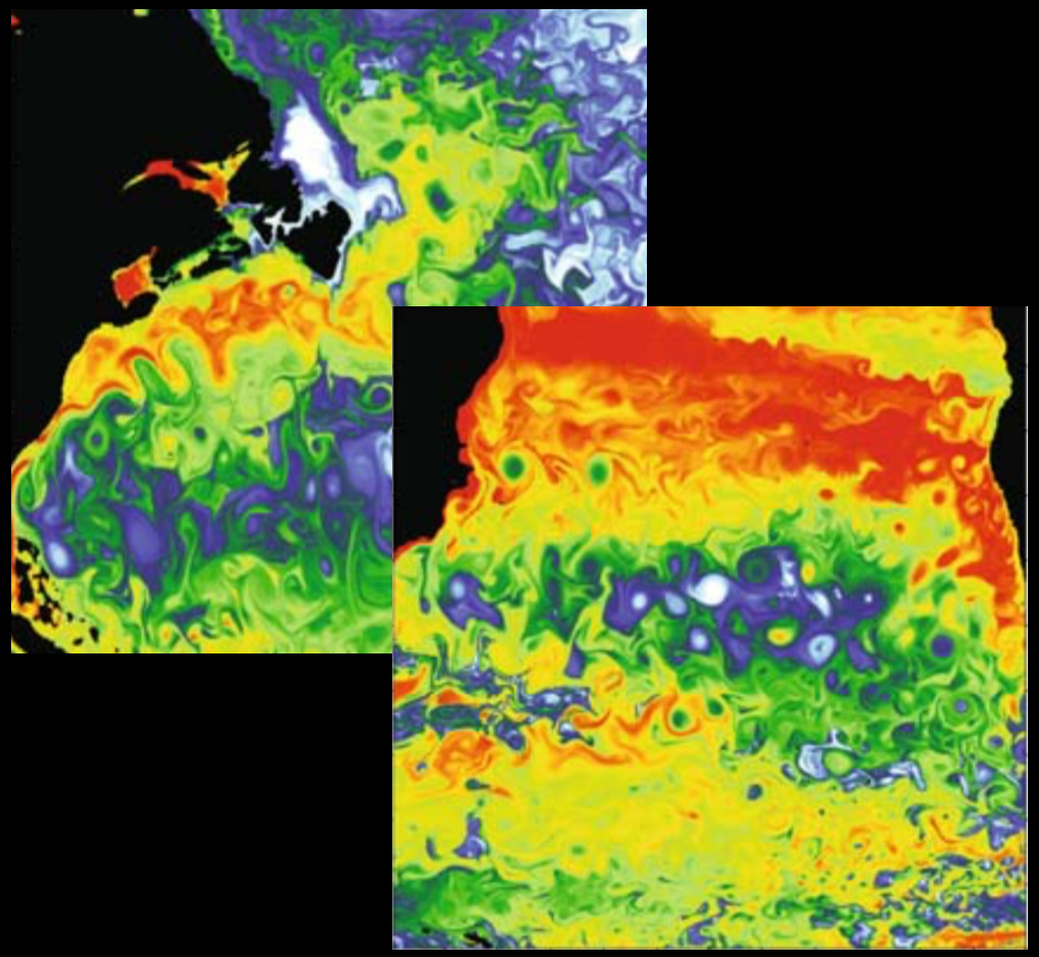

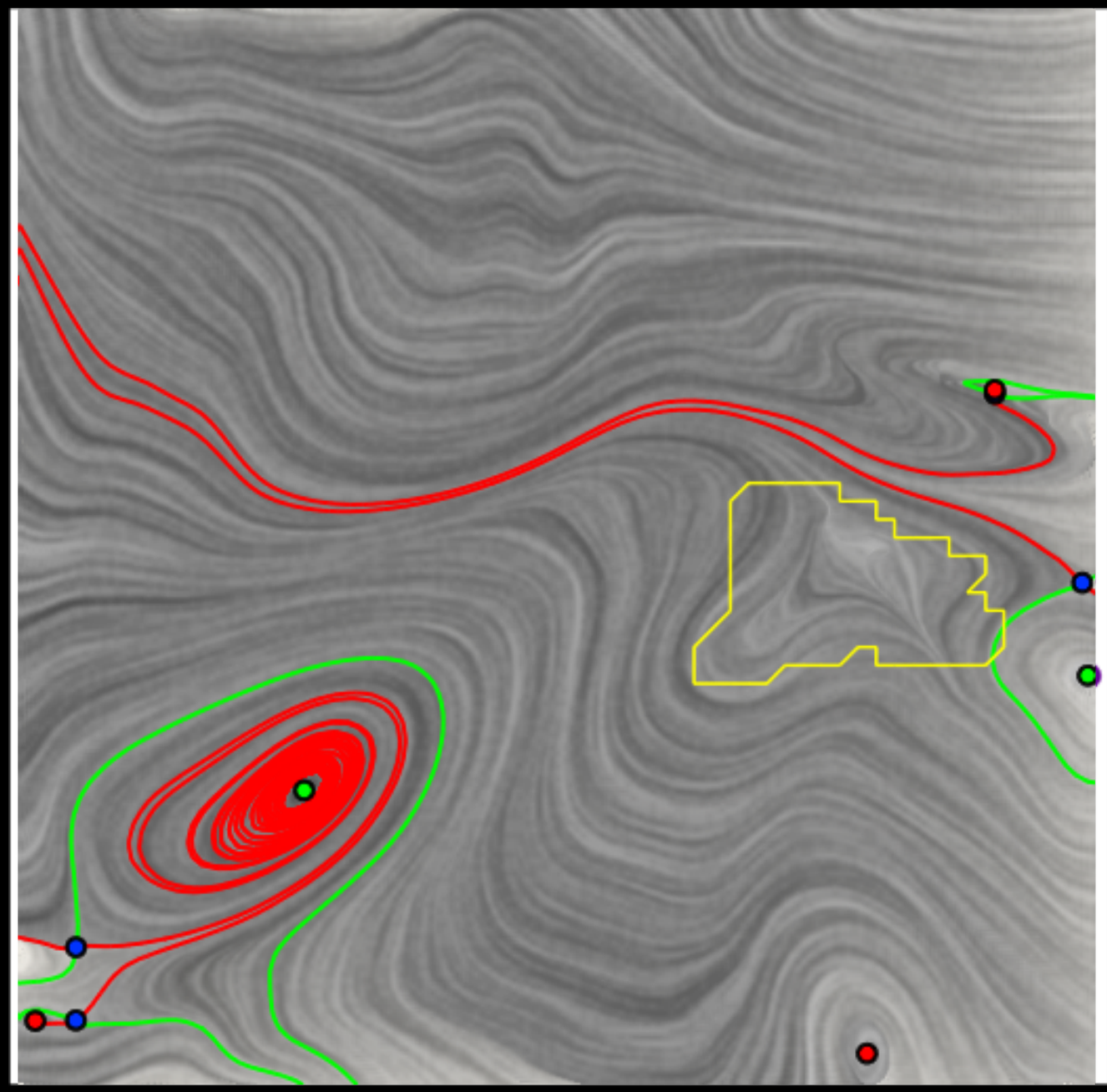

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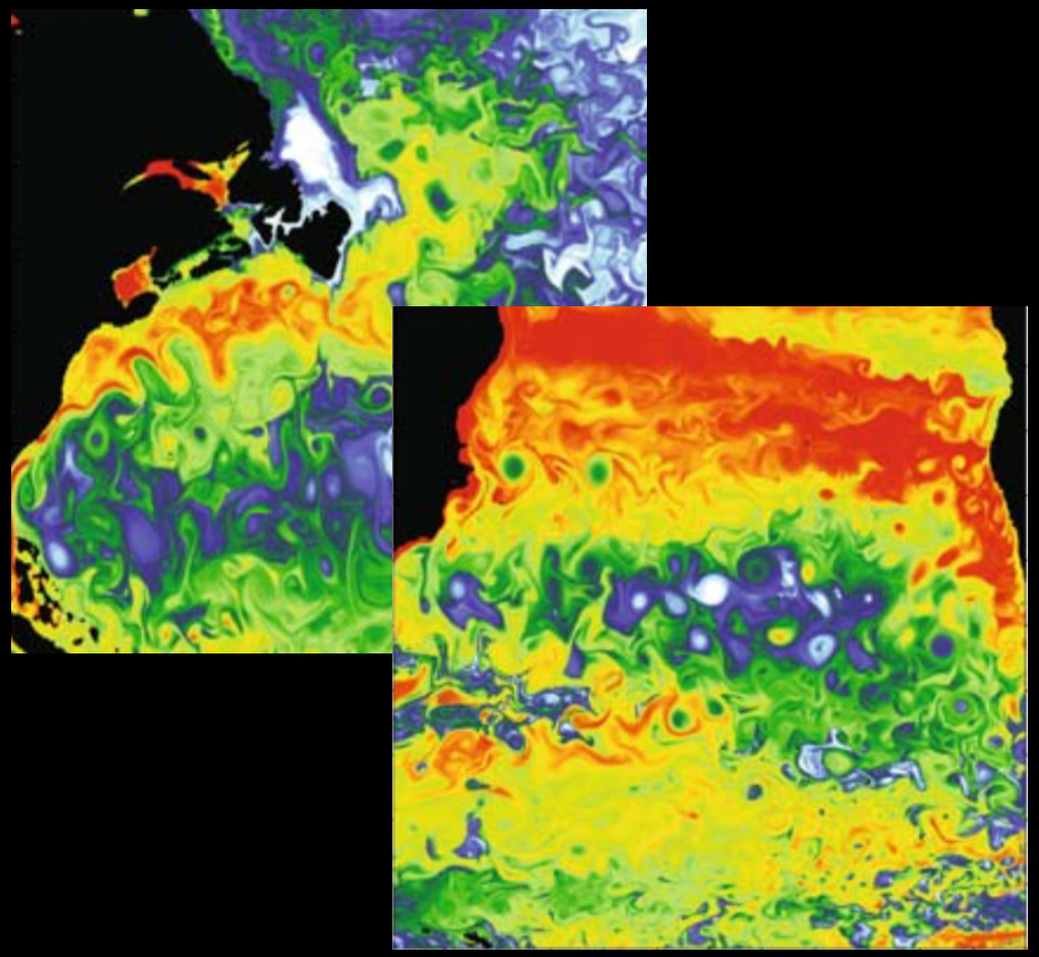

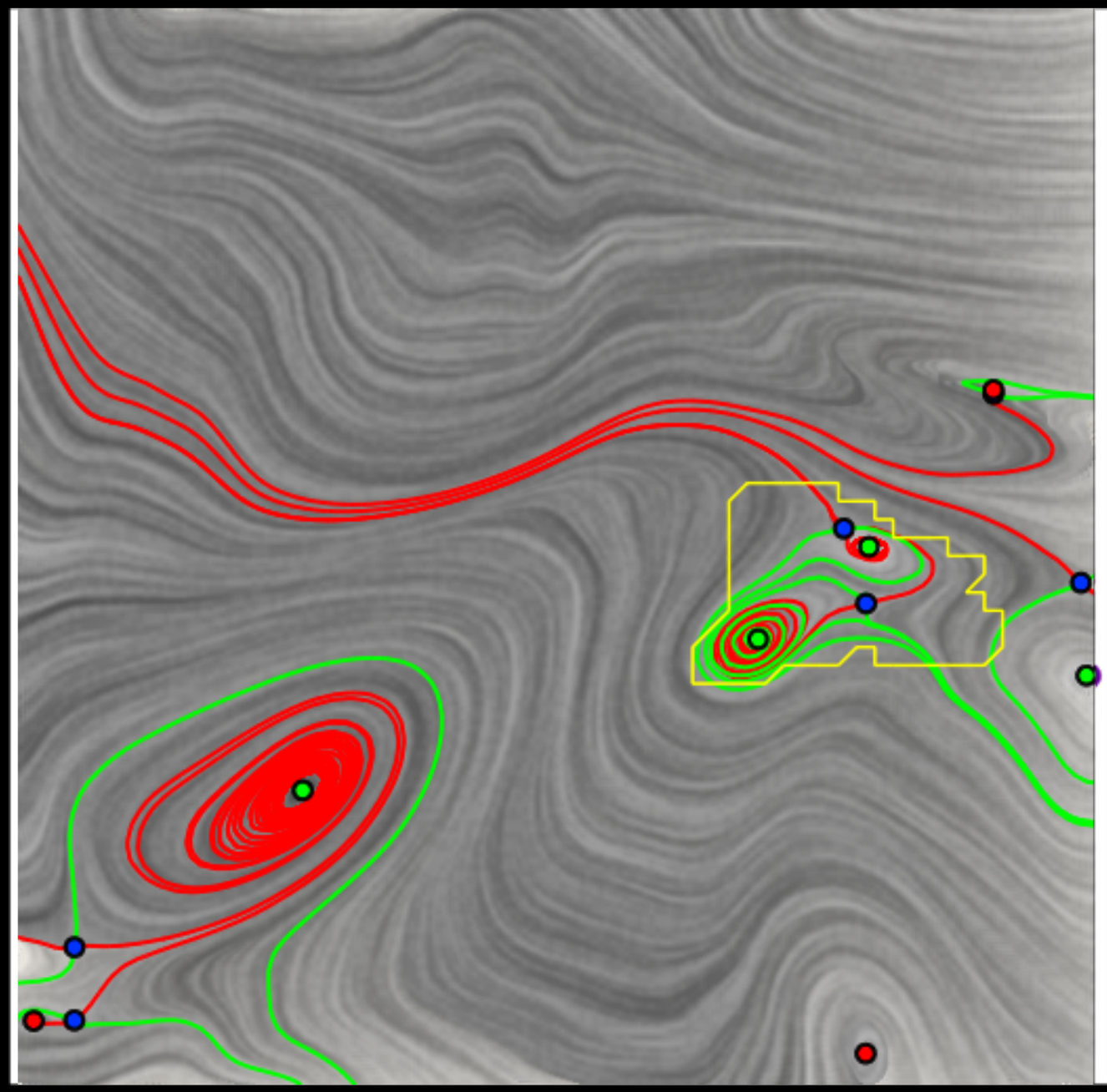

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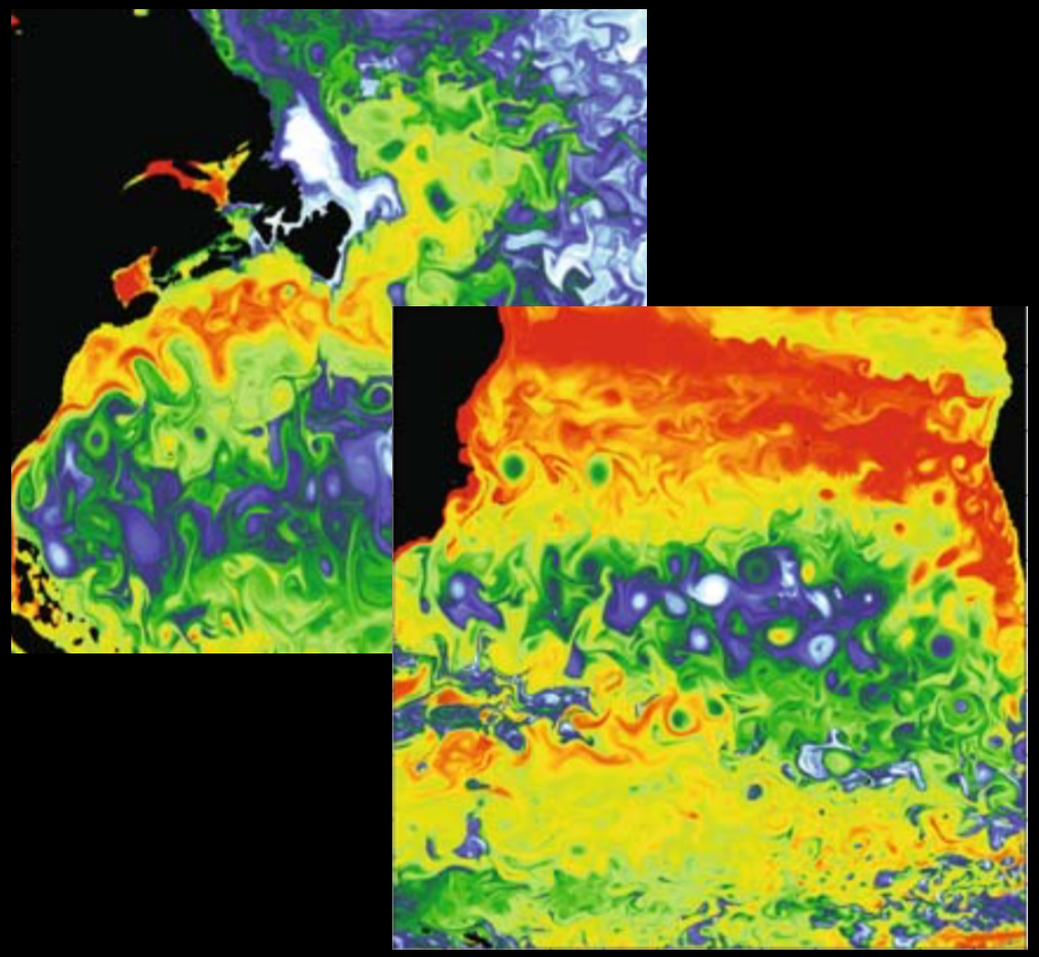

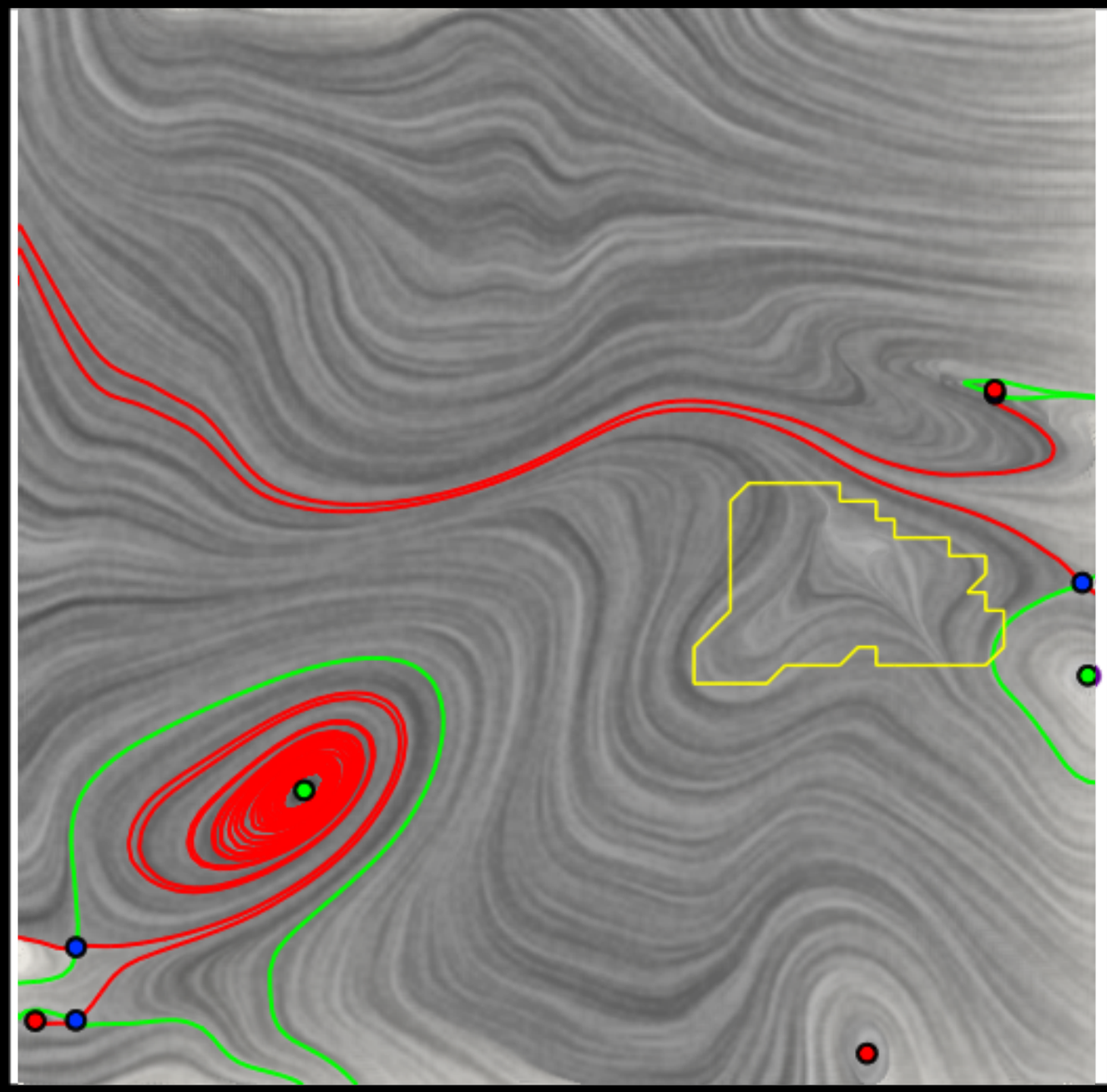

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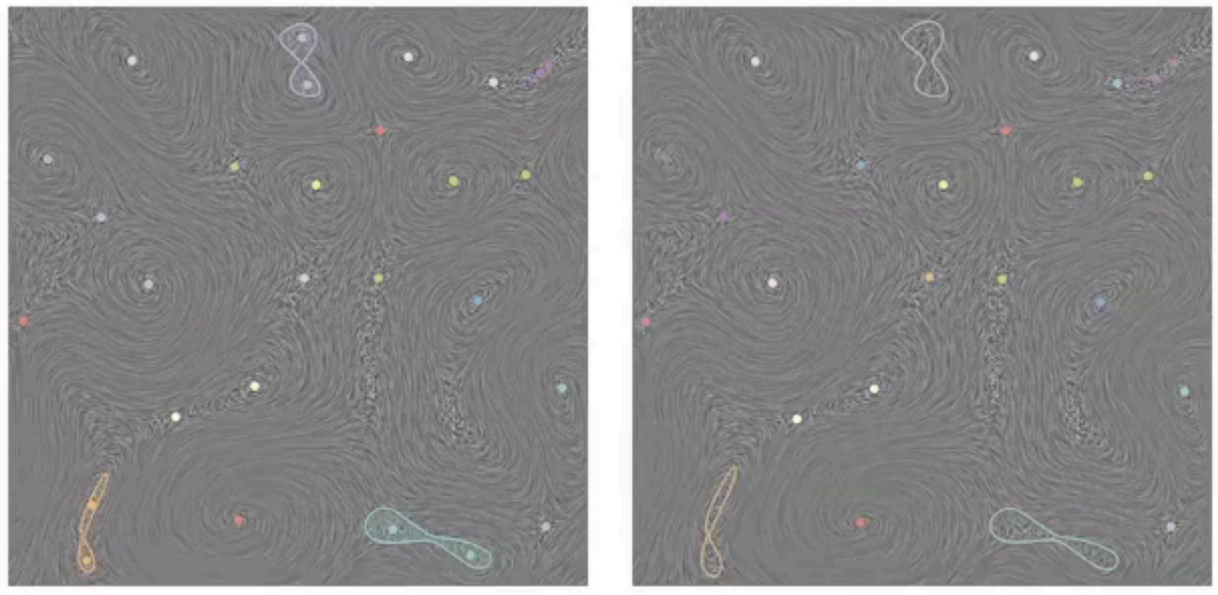
Simplifying 2D unsteady flows

Video:
http://www.sci.utah.edu/~beiwang/publications/Robustness_Unsteady_VF_BeiWang_2015_Supp_Video.mp4

Robustness-Based Simplification of 2D Steady and Unsteady Vector Fields

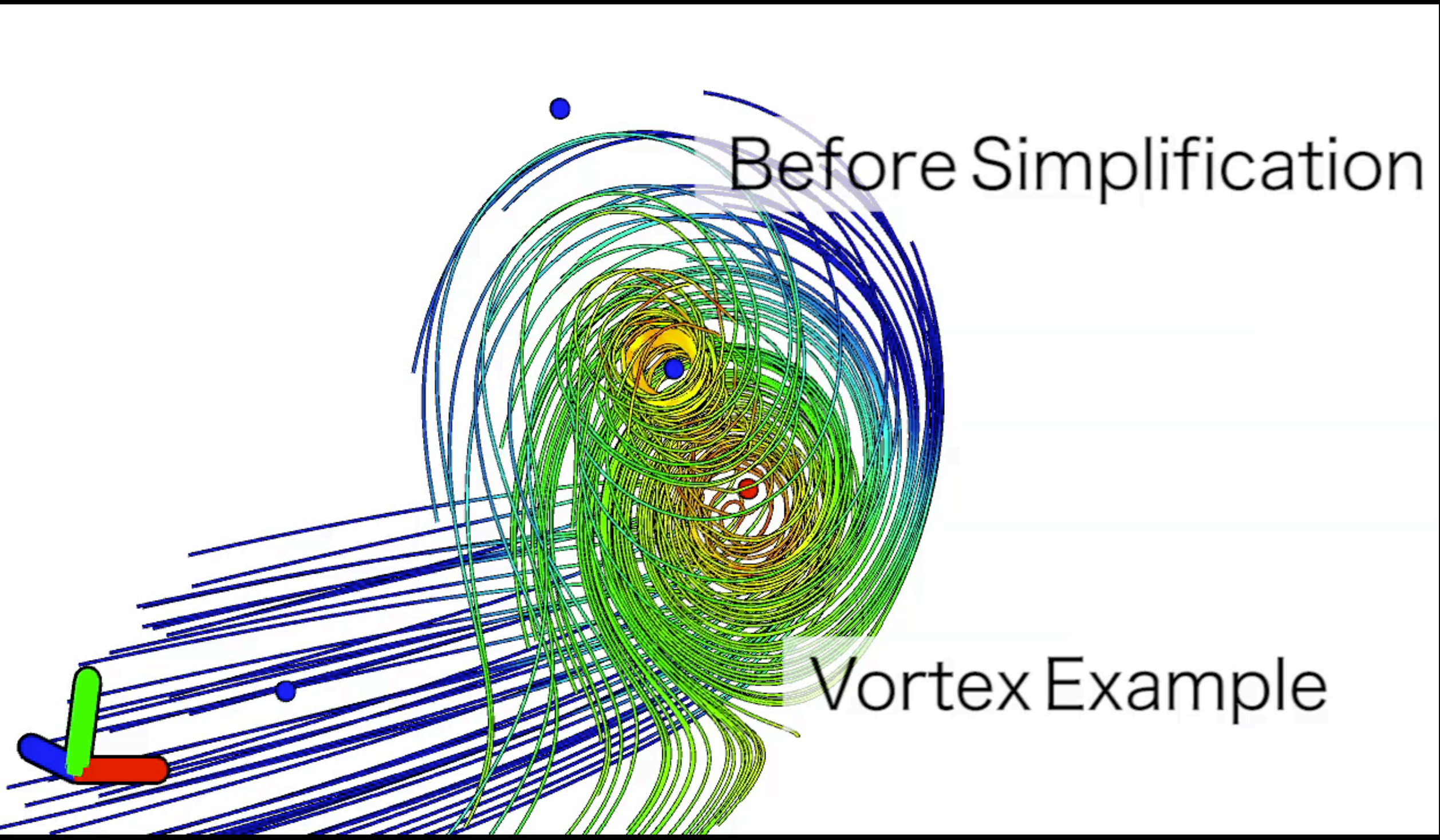
Primoz Skraba
Bei Wang
Guoning Chen
Paul Rosen



video clips of the simplification of unsteady flows

Visualize flow in 3D

Video:
http://www.sci.utah.edu/~beiwang/publications/3D_VF_Robustness_Vortex_BeiWang_2015_video.mp4



Visualize flow in 3D

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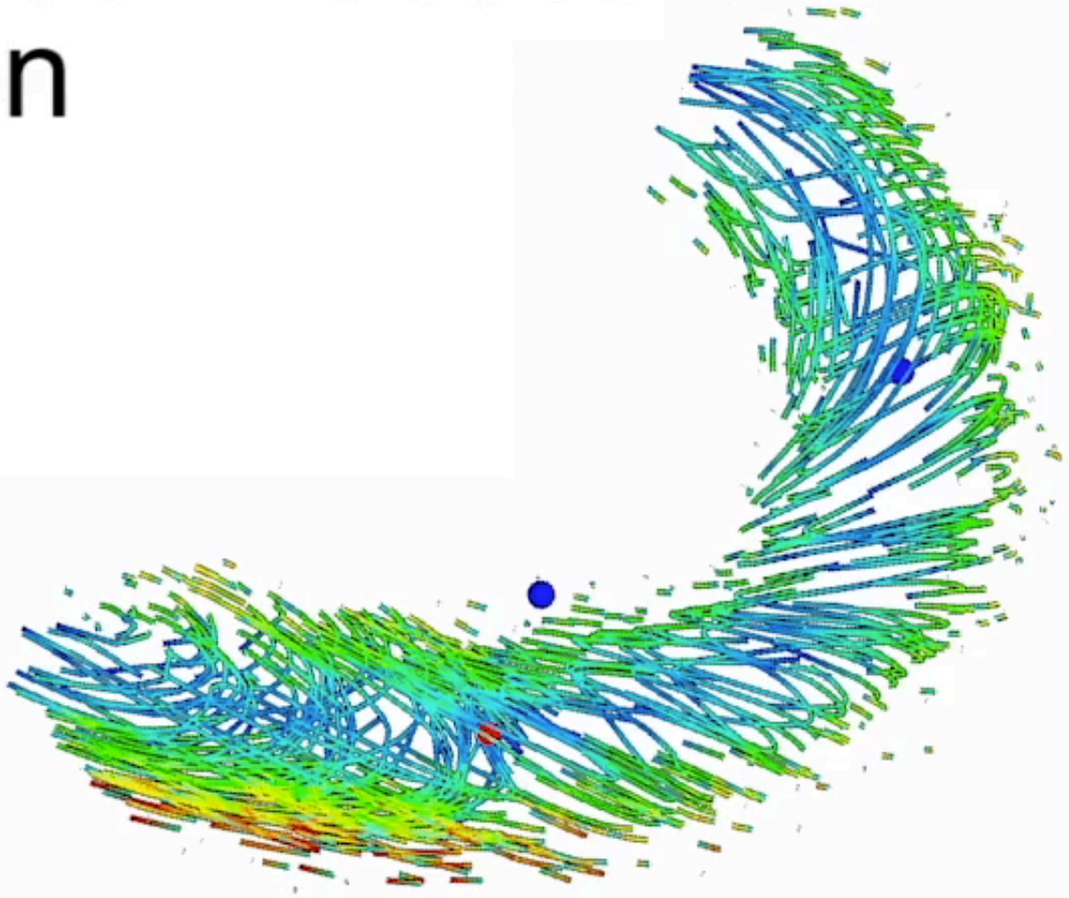
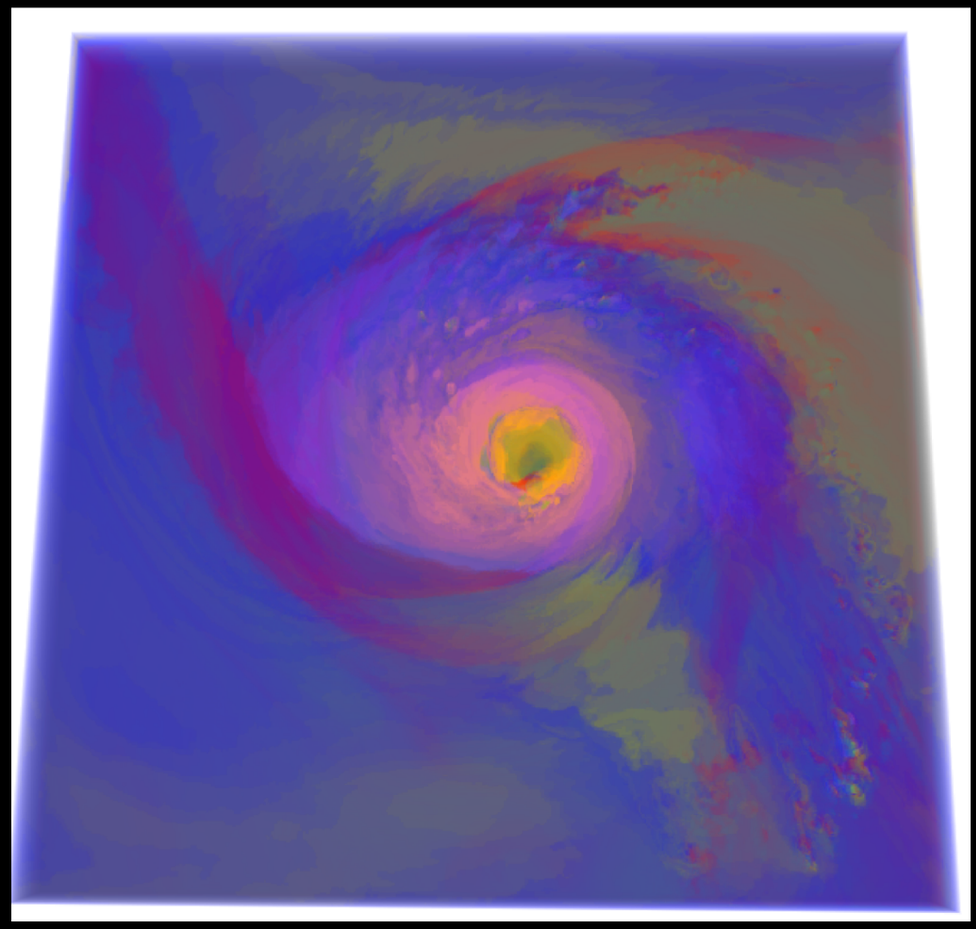
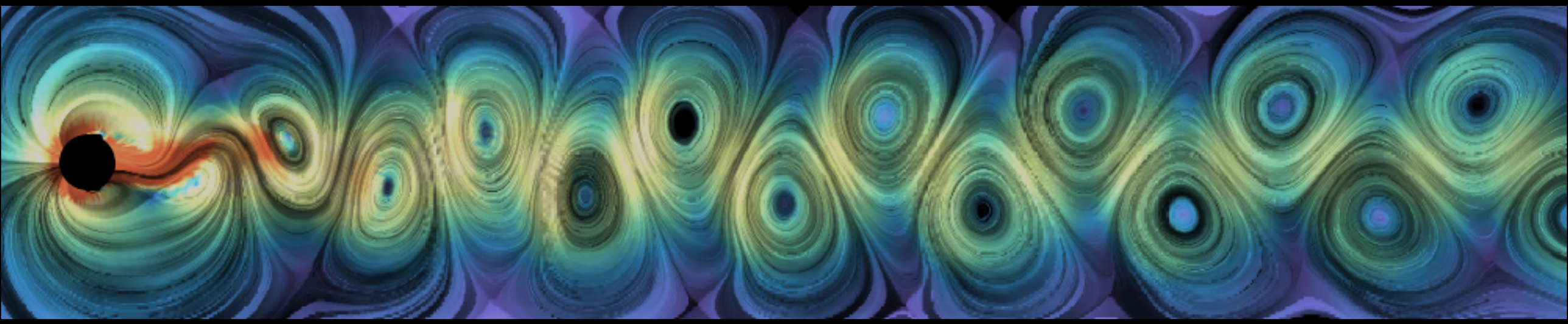
Critical Point Cancellation in 3D Vector Fields: Robustness and Discussion



Understand turbulent flow

Source: NASA





[Wang, Bujack, Rosen, Skraba, Bhatia and Hagen]