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A WALL STREET JOURNAL  
BEST BOOK FOR INVESTORS

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# A RANDOM WALK DOWN *Wall Street*



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*The*  
Time-Tested  
Strategy  
*for*  
Successful  
Investing  
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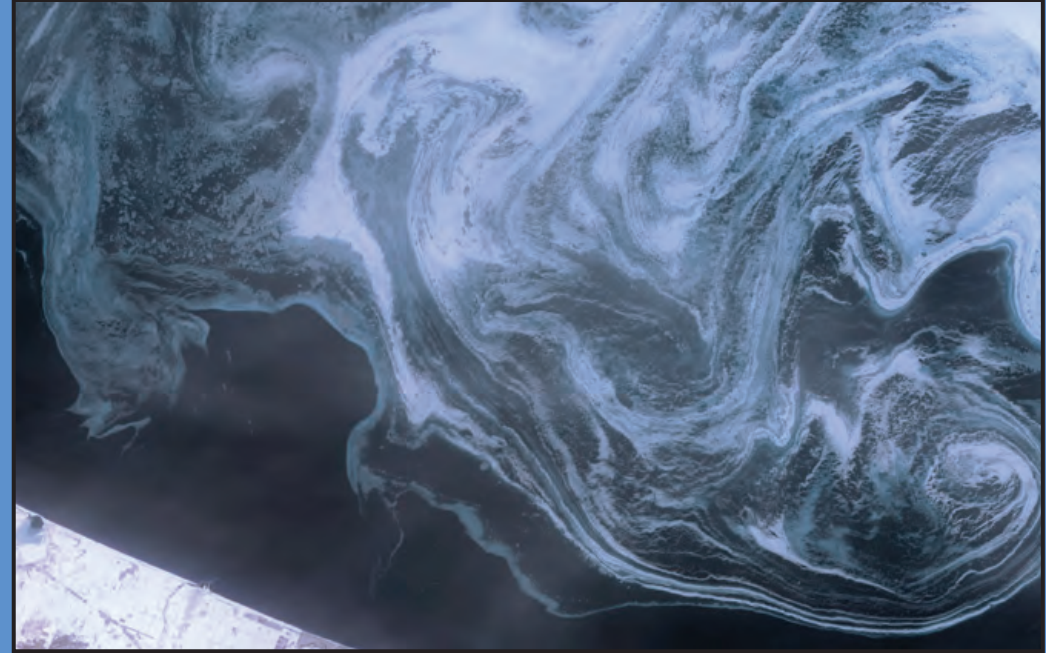
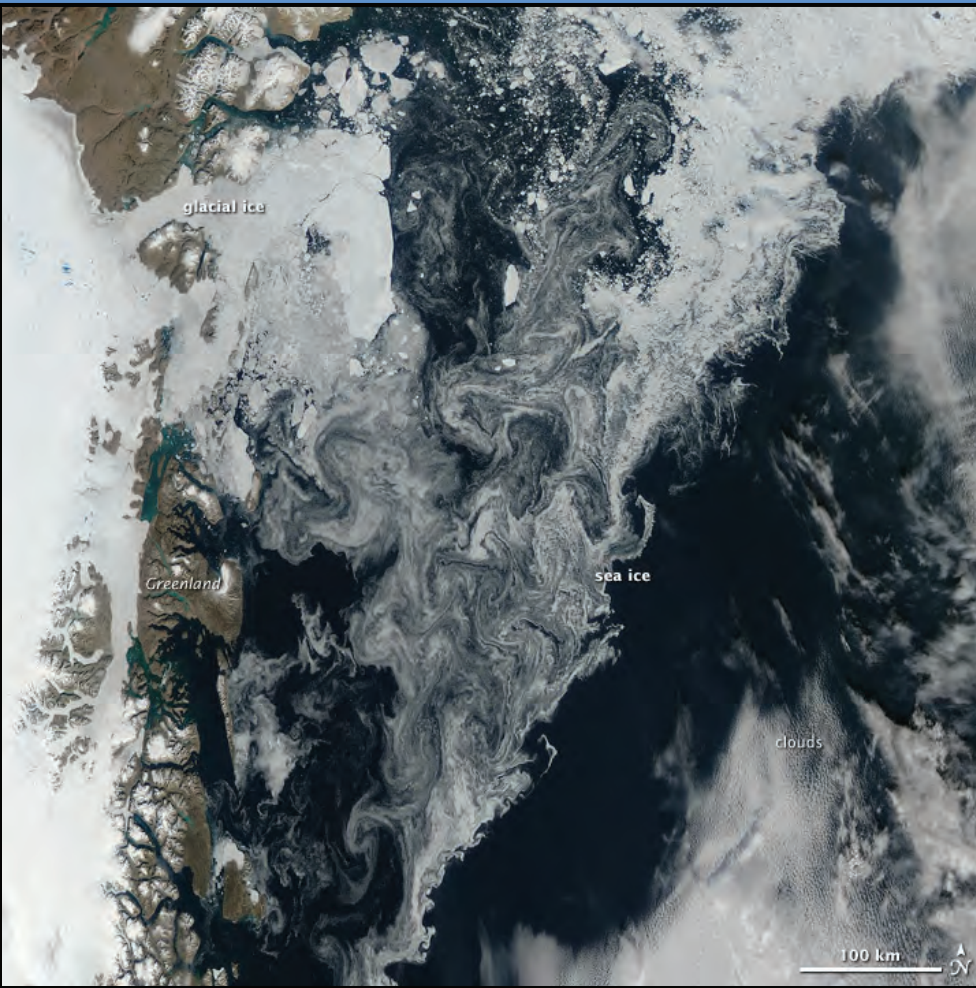
**BURTON G. MALKIEL**

COMPLETELY REVISED and UPDATED



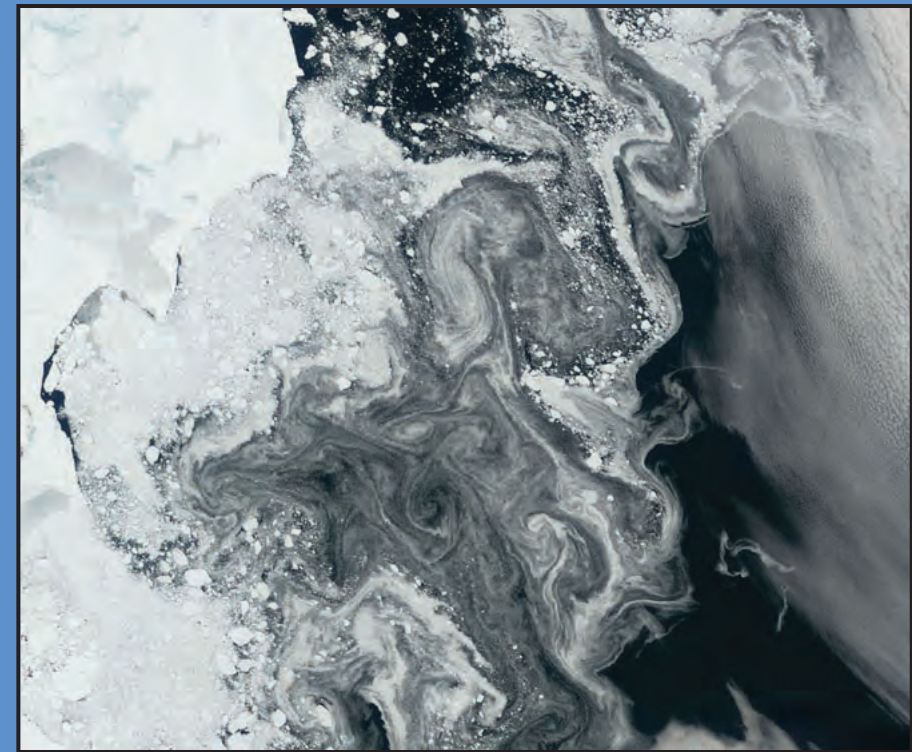
***Advection-diffusion*** plays a key role in the transport of sea ice in atmospheric and oceanic flows.

Ice in the Greenland Sea ( $77.5^{\circ}$  N,  $9^{\circ}$  W), NASA, 2014



Sea of Okhotsk, NASA, 2009

Off the northeastern coast of Greenland, NASA, 2006





# advection enhanced diffusion

## effective diffusivity

nutrient and salt transport in sea ice  
heat transport in sea ice with convection  
sea ice floes in winds and ocean currents  
tracers, buoys diffusing in ocean eddies  
diffusion of pollutants in atmosphere

advection diffusion equation with a velocity field  $\vec{u}$

$$\frac{\partial T}{\partial t} + \vec{u} \cdot \vec{\nabla} T = \kappa_0 \Delta T$$

$$\vec{\nabla} \cdot \vec{u} = 0$$



homogenize

$$\frac{\partial \bar{T}}{\partial t} = \kappa^* \Delta \bar{T}$$

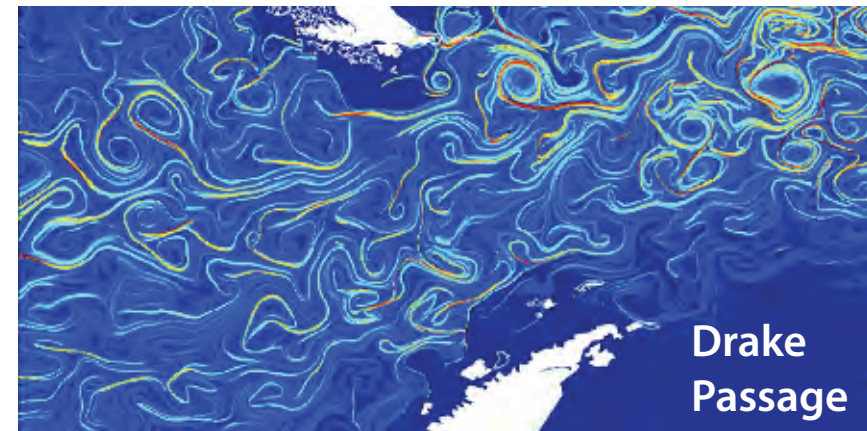
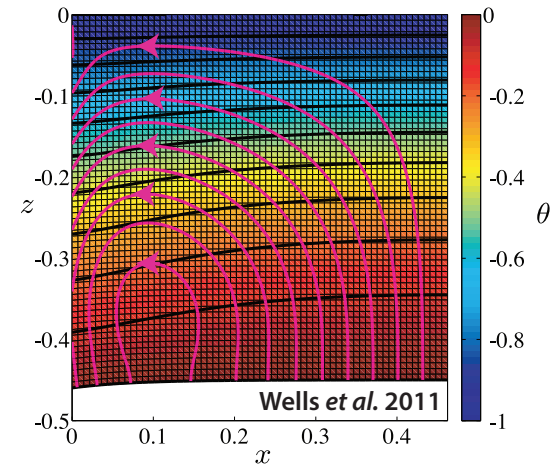
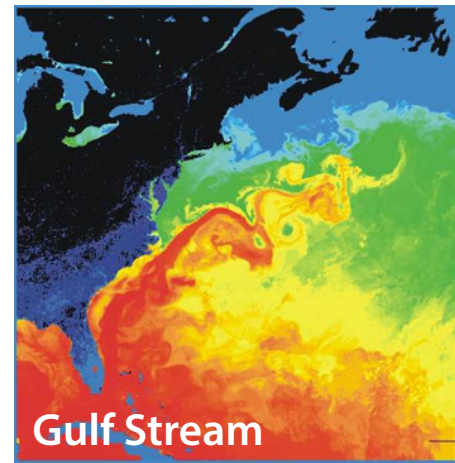
$\kappa^*$  effective diffusivity

**Stieltjes integral for  $\kappa^*$  with spectral measure**

*Avellaneda and Majda, PRL 89, CMP 91*

Murphy, Cherkaev, Xin, Zhu, Golden, *Ann. Math. Sci. Appl.* 2017

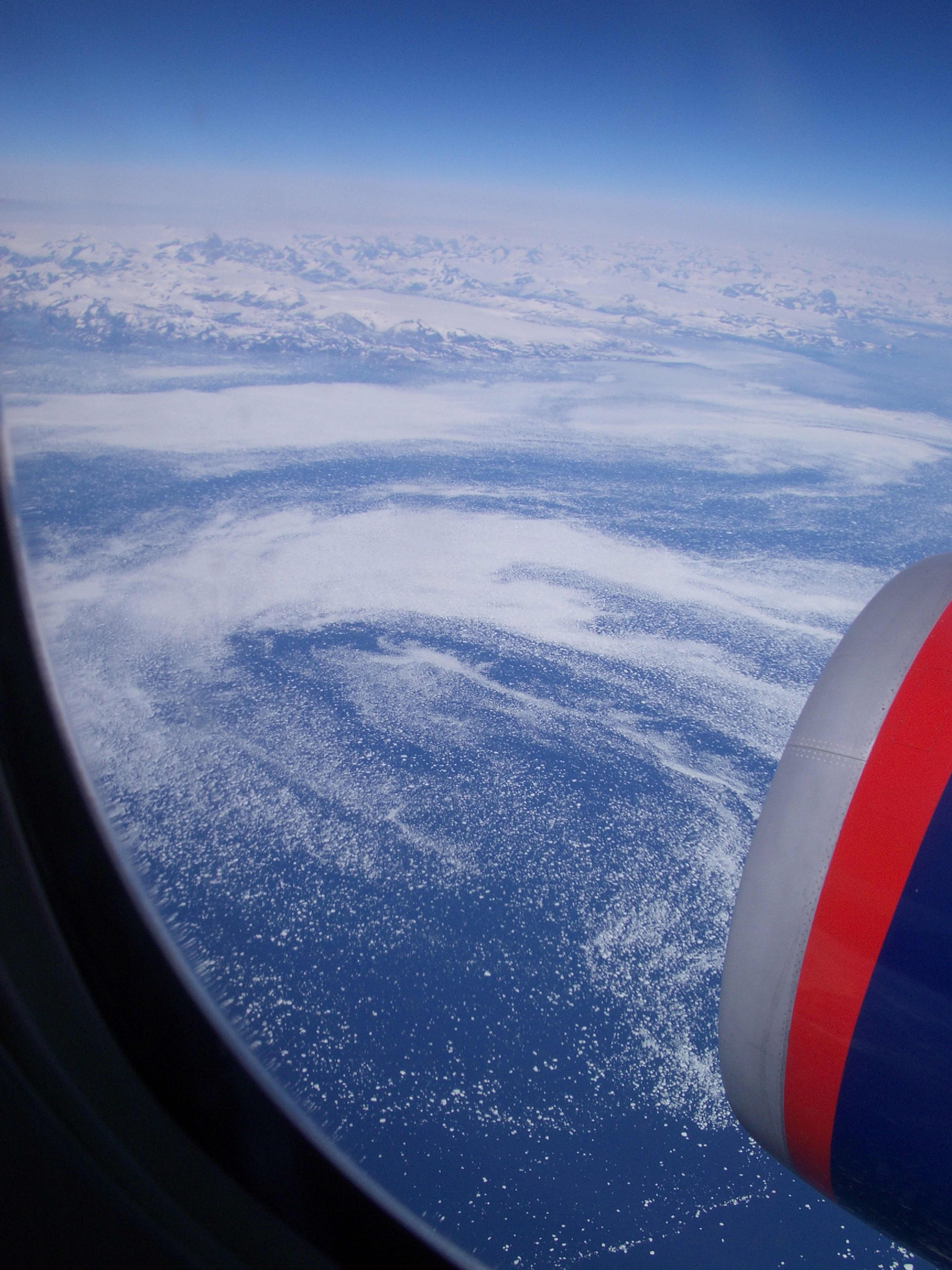
Murphy, Cherkaev, Zhu, Xin, Golden, *J. Math. Phys.* 2019























# *Ice floe diffusion in winds and currents*

## Anomalous diffusion and sea ice dynamics

*sub- and super-diffusive behavior of motion of sea ice floes as tracked by buoy data*

Jennifer Lukovich, Jennifer Hutchings, David Barber, *Ann. Glac.* 2015

Huy Dinh, Elena Cherkaev, Ken Golden, 2019

## Home ranges in moving habitats: polar bears and sea ice

*“diffusive” polar bear motion superimposed with drifting sea ice*

Marie Auger-Méthé, Mark Lewis, Andrew Derocher, *Ecography*, 2016

