

A WALL STREET JOURNAL
BEST BOOK FOR INVESTORS

A RANDOM WALK DOWN *Wall Street*



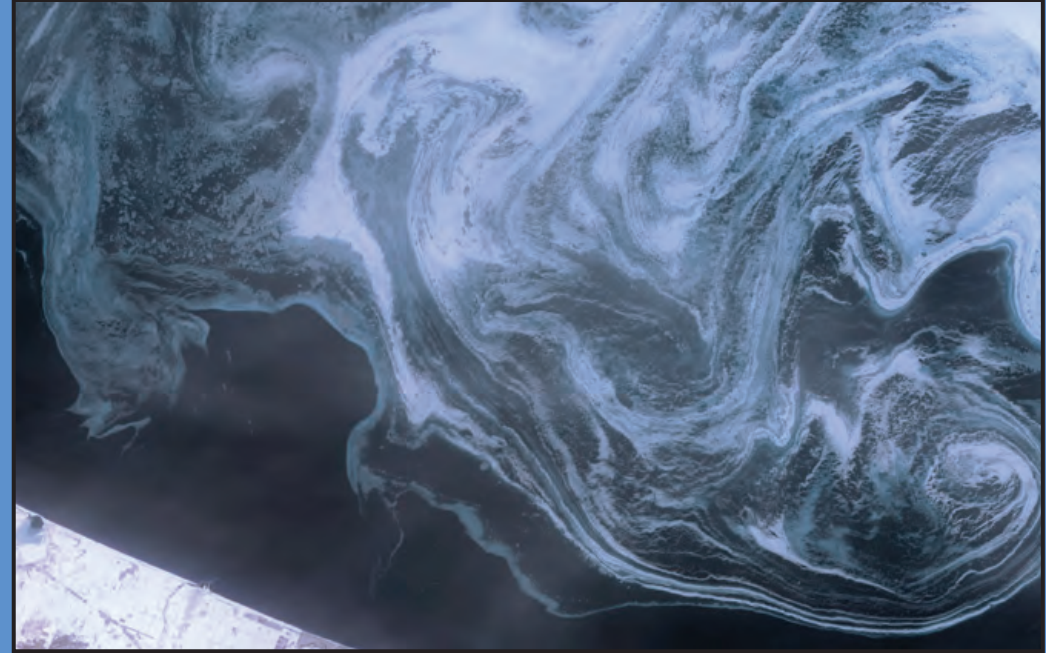
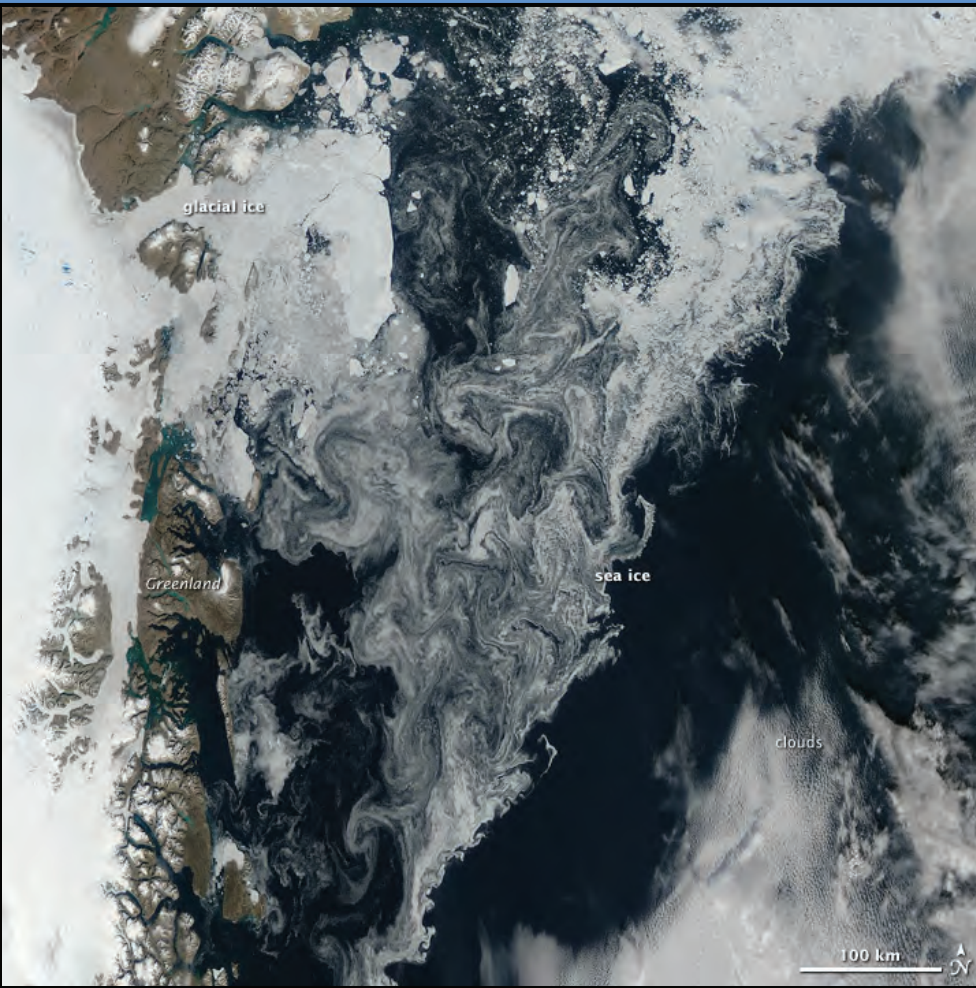
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The
Time-Tested
Strategy
for
Successful
Investing
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BURTON G. MALKIEL

COMPLETELY REVISED and UPDATED

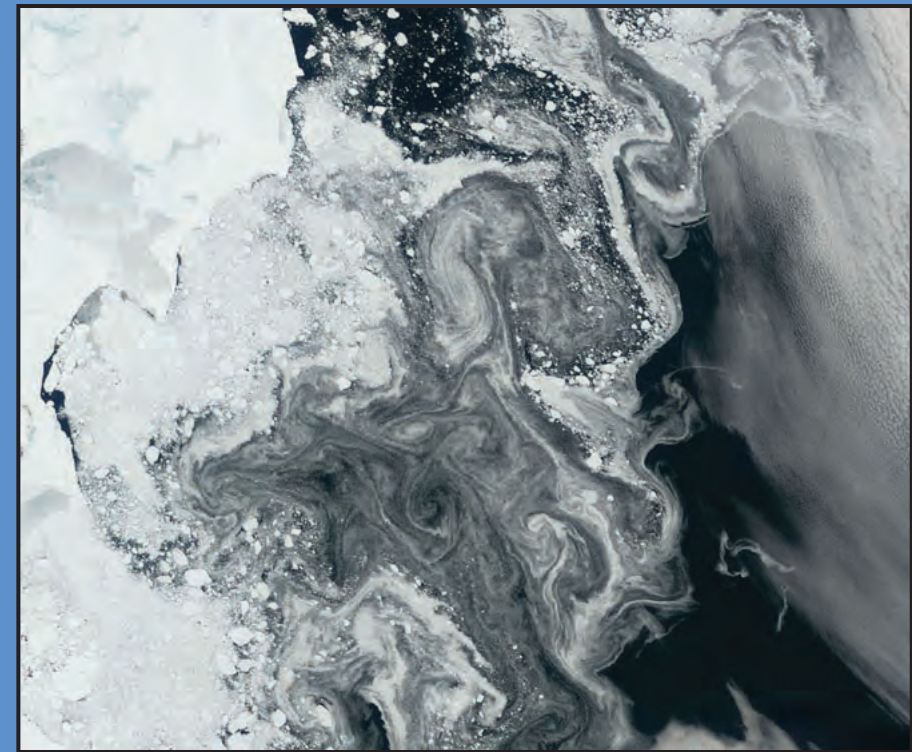
Advection-diffusion plays a key role in the transport of sea ice in atmospheric and oceanic flows.

Ice in the Greenland Sea (77.5° N, 9° W), NASA, 2014



Sea of Okhotsk, NASA, 2009

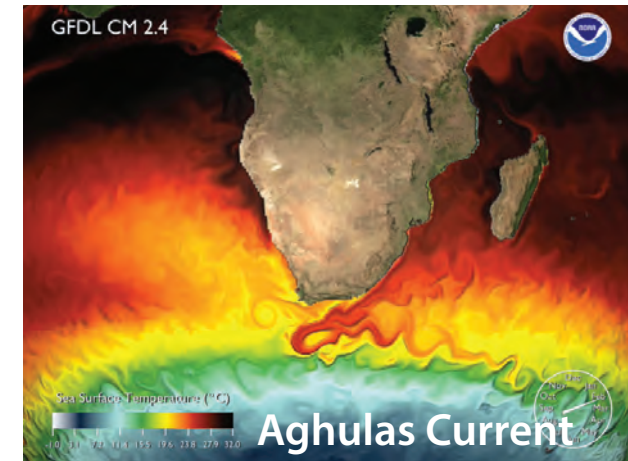
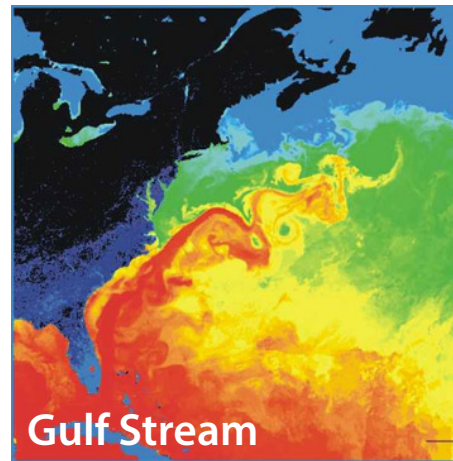
Off the northeastern coast of Greenland, NASA, 2006



advection enhanced diffusion

effective diffusivity

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



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

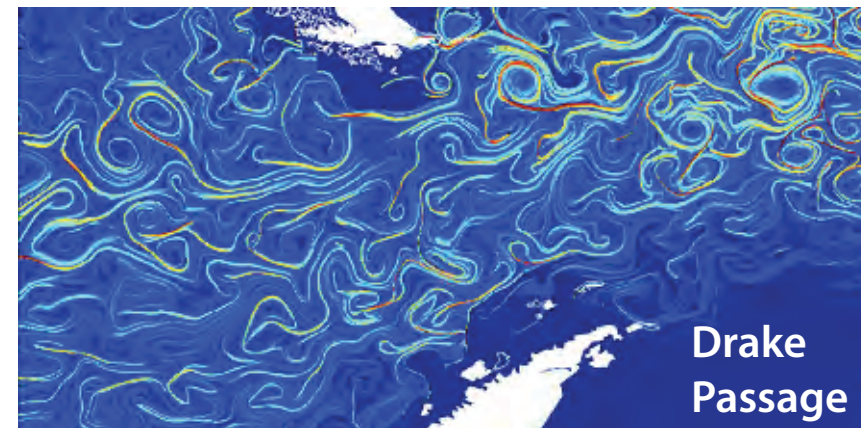
$$\frac{\partial \bar{T}}{\partial t} = \kappa^* \Delta \bar{T}$$

κ^* effective diffusivity

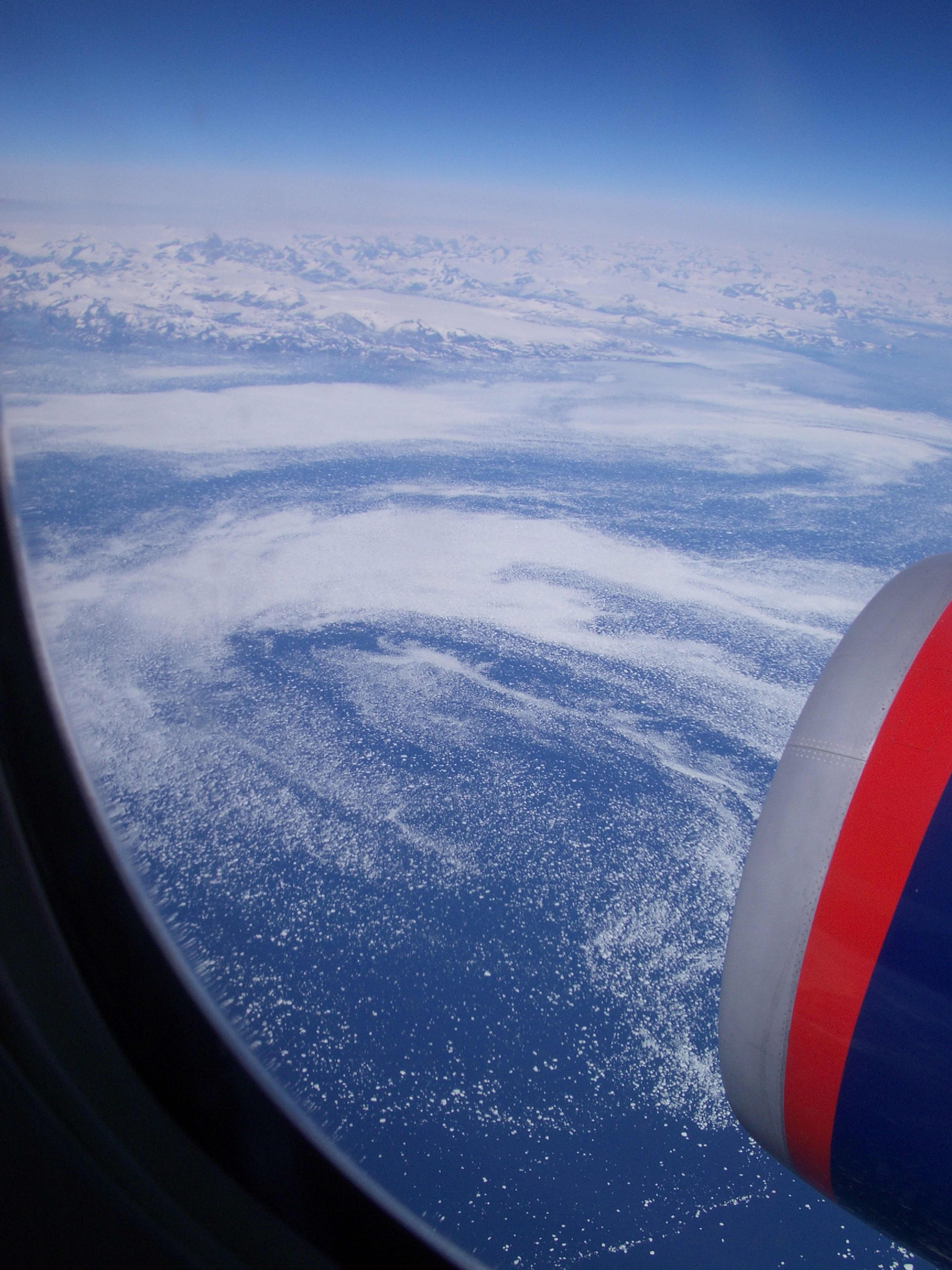
Stieltjes integral for κ^* with spectral measure

Avellaneda and Majda, PRL 89, CMP 91

Murphy, Cherkaev, Xin, Zhu, Golden, *Ann. Math. Sci. Appl.*
2017 Murphy, Cherkaev, Zhu, Xin, Golden, 2018







advection enhanced diffusion

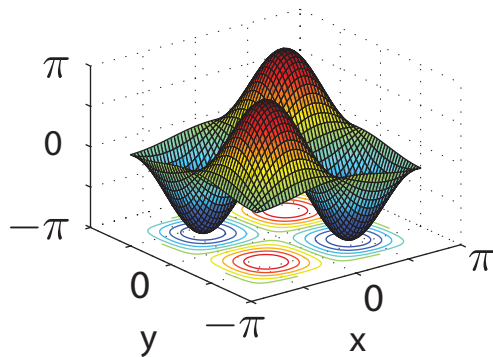
effective diffusivity κ^*

diffusion in a velocity field

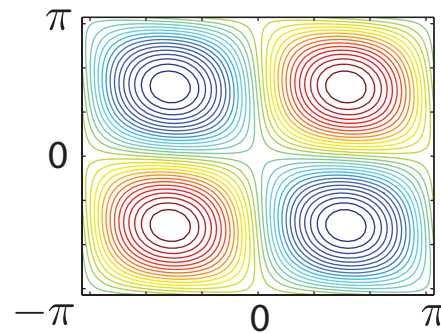
tracers, buoys diffusing in ocean eddies
eddy - enhanced heat and salt transport
enhanced sea ice thermal conductivity
dispersal of pollutants and gases

computation of effective diffusivity and spectral measures for model flows

stream function



streamlines



Murphy, Zhu, Golden, 2013

