Helioseismology
Earth's Winds

- From Meteorology for Mariners

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Historically important for ocean navigation.

Still relevant for ocean racing, shipping.

Strongest winds in S'th's "Reaping Forties".
Uninterrupted ocean...
Dangerous Cape Horn.
1. Warm core $\rightarrow$ low density $\rightarrow$ low surface pressure $\rightarrow$ inward boundary layer flow.

2. Inward flow $\rightarrow$ swirl.

3. Rising motion in core $\rightarrow$ rain $\rightarrow$ latent heat release $\rightarrow$ further warming.

4. Swirl balances pressure gradient. Core temperature determines pressure drop. $\Rightarrow V$
   Swirl velocity determines core radius.
   \[ V^2 \sim 2gD\frac{dT}{T} \]

5. Swirl $\rightarrow 0$ at top; friction slows b.l. gas.
Fig. 1. Visible optical depths derived from the Sun-diode measurements made at the two Viking Landers (Colburn et al. 1989). Line indicates the opacity of a global haze inferred from Viking Lander 1 surface-pressure data (Zurek 1981). Initial appearance or detection of all observed regional dust clouds, hazes or obscurations (vertical lines) and of planet-encircling dust storms (arrows) are indicated at the top of the upper panel. Dust events are listed in Table III (figure adapted from Zurek and L. Martin 1992).