Geophysical Fluid Dynamics - the study of fluid flow on planets, esp. Earth, at scales
where rotation + stratification matter

Interacting systems:
- wind stress
- heat flux
- moisture flux

Scales of "energy containing" motions

<table>
<thead>
<tr>
<th></th>
<th>Atmosphere ¹</th>
<th>Ocean ²</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>1000 km</td>
<td>50 km</td>
<td>1. Mid-latitude cyclonic storm</td>
</tr>
<tr>
<td>Height</td>
<td>10 km</td>
<td>1 km</td>
<td>2. Gulf Stream eddy</td>
</tr>
<tr>
<td>Velocity</td>
<td>10 m s⁻¹</td>
<td>0.5 m s⁻¹</td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>1.2 kg m⁻³</td>
<td>1000 kg m⁻³</td>
<td></td>
</tr>
</tbody>
</table>
Shared scale

frequency of Earth's rotation ~ 1/day

Differences

Atm. is heated at its bottom surface, and internally
Ocean is heated at its top surface

Questions

Why are atmospheric flows so much faster?

Why are atmospheric flows so much larger in horizontal scale?

How do these motions gain and lose energy?