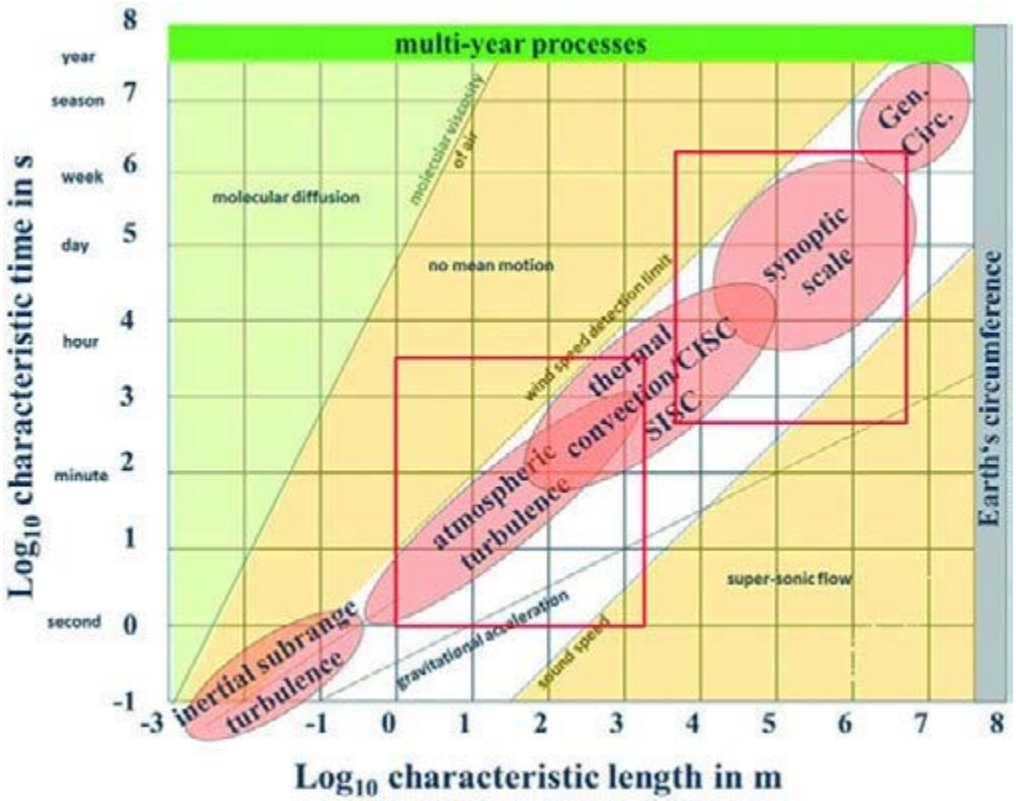
Unit 1 Meoscale Dynamics ATM478/678

Solve the problems assigned at your class level, scan the work in as a pdf file, name the file Firstname_Lastname_unit_1.pdf, where Firstname and Lastname are placeholders for your own first and last name, respectively, and submit the file to cmoelders@alaska.edu.

1. Graduate students: Determine the wind speed that is needed for assuming that the Coriolis effect is negligible in the equation of motions for a flow over the Rocky Mountains in Colorado (200 km), the southern Alps in New Zealand (100 km) and the Snowy Range in Wyoming (20 km). For your analysis you can use the figure below for the length and time scales.



2. All students: A lee wave cloud was observed. The radiosonde observations recorded a potential temperature at 1453, 3053, and 9270 m of 281.7, 300.8 and 320.1K with a zonal component of the wind of -1.5, 15.9 and 24.1 m/s, respectively. The horizontal orographic wavelength is given by $\lambda=2\pi/k$. Calculate the mean potential temperature and wind speed for the layer from 1453 to 3052 as well as for the layer from 3053 to 9270 m. Also determine the Brunt-Väisalä frequency and the Scorer parameters for these layers. Note that wave number of the orography that forces the wave must be less than the Scorer parameter for the lower layer, but larger than that of the upper layer for a trapped lee wave. Your results will give you the bounds of orographic wavelength. This means for a trapped lee wave, the orography must have a wavelength longer than the wavelength of the lower layer, but less than the wavelength for the upper layer.