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Problems with different time scales

In many applications the solutions can be separated into different parts which vary on different time scales. For example, in meteorology we have Rossby waves, gravity waves and sound waves with time scales 24 hours, 2 hours and 1 min, respectively. The interaction between these waves is rather weak and for problems, where there is only one space scale, one has developed techniques to initialize the data such that the solutions vary only on one time scale.

However, if there is more than one space scale present, then the situation is more complicated. We shall discuss this question and apply it to meteorological problems.