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The Monge-Kantorovich problem in meteorology and oceanography

There is a close link between large-scale fluid dynamics, which can be described in terms of rearranging fluid particles with specified properties, and the Monge-Kantorovich problem, which finds rearrangements that minimise certain integrals. I will illustrate how a number of problems involving significant weather events can be formulated this way, including effects of mountains and thunderstorms. All of these can be written in terms of energy minimisation subject to suitable constraints. I will also show how this theory can be used to show that the 'permanently unsteady' state of the atmosphere is a natural conequence of the large-scale dynamics.