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Data assimilation and the reconstruction of surface fluxes in quasigeostrophic and transport equations.

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In this contribution, we will analyse simple data assimilation schemes that not only estimate the underlying states of a dynamical system but simultaneously reconstruct unknown components of the dynamics. We focus on quasigeostrophic and transport-diffusion equations (for instance for atmospheric aerosols or tracer gases) and reconstruct forcings or surfacd fluxes, along with the underlying dynamical states. Tracer gases and aerosols play an important role in the dynamics of the atmosphere; aerosols for instance act as condensation nuclei and thus have a major influence on precipitation, while tracer gases such as ozone, methane, or CO_2 impact the radiative transfer and are thus linked to important atmospheric phenomena such as the ozone hole and the energy budget of the planet ("greenhouse effect"), respectively. Furthermore, gases as well as aerosols (especially in the lower troposphere) are common pollutants with strong and potentially adverse effects on the environment, human activity, and health. We discuss two algorithms that both apply in the context of the quasigeostrophic as well as the transport-diffusion equations.