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Retrieving the source of a pollution using satellite observations

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The identification of the sources of tracer species assumes significance in formulating policies for prevention/control of air pollution. The remote satellite monitoring is planned or already active for many species emitted on large areas, for instance CO observed by MOPITT and CH4 and NOx by TES. Concentrations, obtained over a wide area, are measured and integrated on a column of air, often, with the vertical resolution of a profile.

Retrieving the source can be dealt as an inverse problem mathematically. The relationship between the source and the receptor depends on the prevailing meteorological conditions. Under the same conditions, inverse relationship is expected to hold good. In particular, identical sources giving rise to different concentrations at ground level for different meteorological conditions should nevertheless be retrieved as identical. Since it is not possible to find data corresponding to this situation, alternatively one can produce them synthetically.

We have used a contrasted climatology of India with weak winds from the north in January during winter season and strong winds from the south in July in monsoon season. This enabled us to show that only the renormalized inversion, using appropriate geometric weights, meets the previous requirement. Even when such information as a satellite image is available, the renormalization seems to be necessary.