Optimal network for monitoring regional CO_2 emissions

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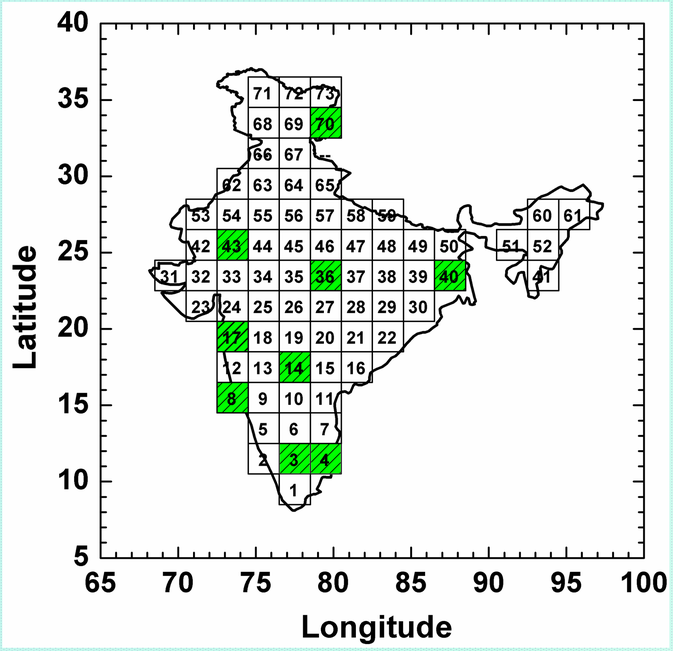
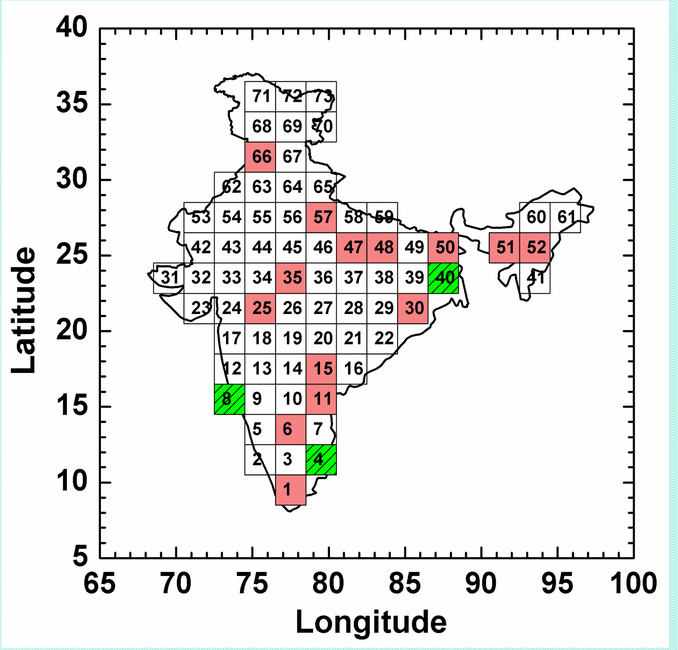
Candidate stations



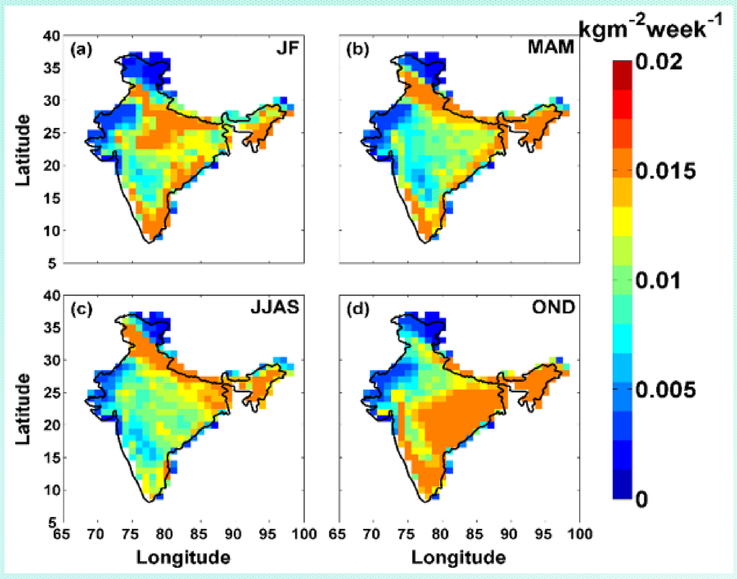
Why we need CO_2 observation network ?

Information about the sources and sinks are embedded in the measured concentration. Hence, the identification of measurement location is a key factor that decides the quality of CO_2 flux estimation.
One of the criterion for the selection of best network is based on reducing variance of estimates.
A network design need to be in the form of how much new information is added by new measurements, relative to what is already known.

Optimal network



Data and Methodology



Prior uncertainty (CDIAC + CASA)

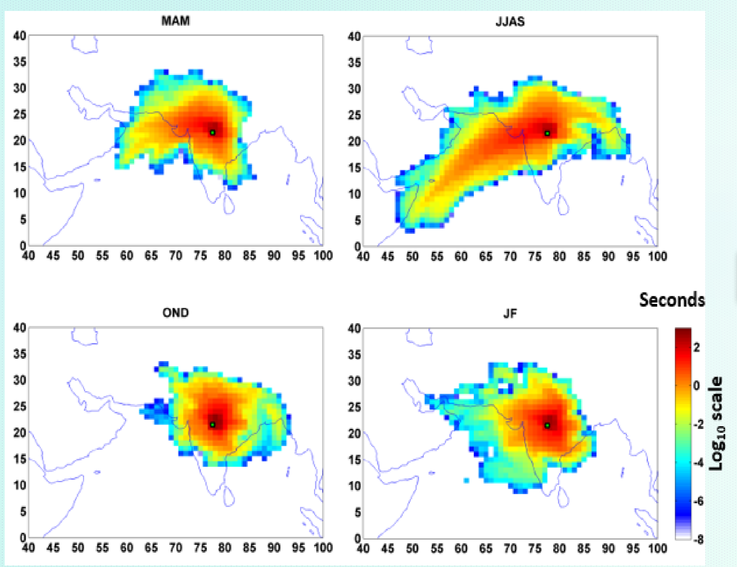
Bayesian inversion

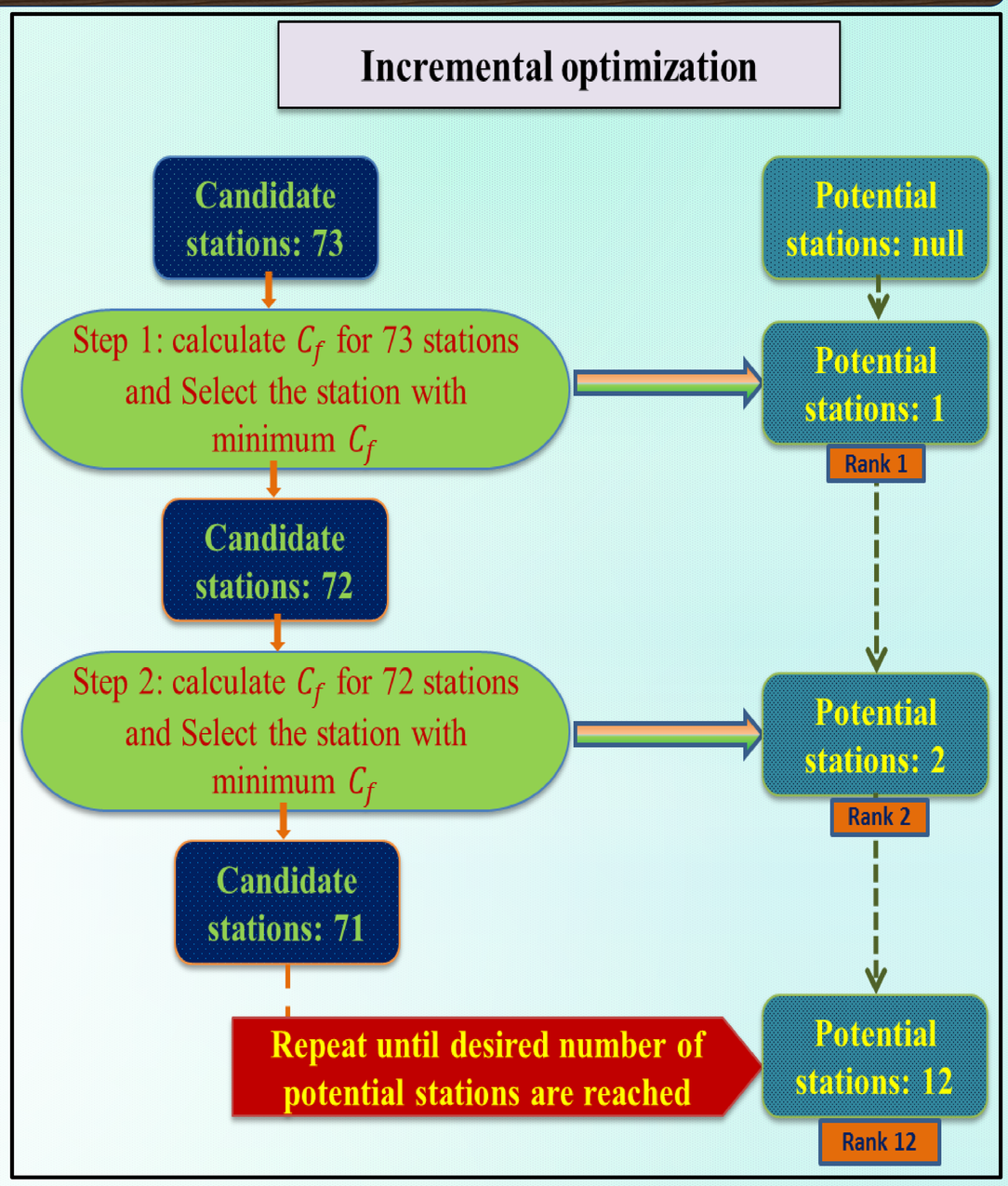
Observation uncertainty = 2 ppm

$$C_f = \left(T' C_c^{-1} T + C_{f_0}^{-1}\right)^{-1}$$

Uncertainty in flux estimation

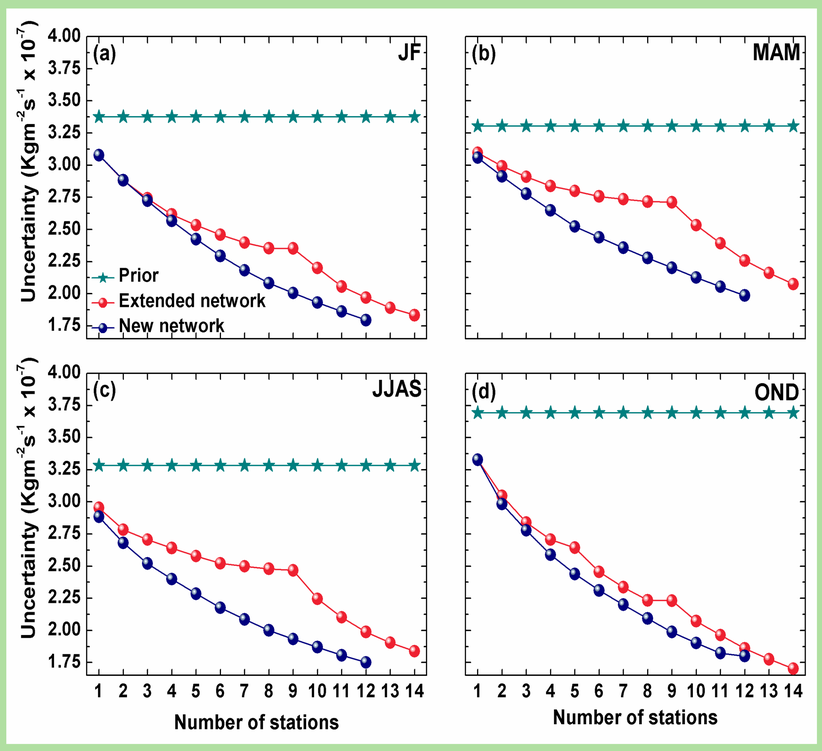
Emission sensitivity (FLEXPART model)



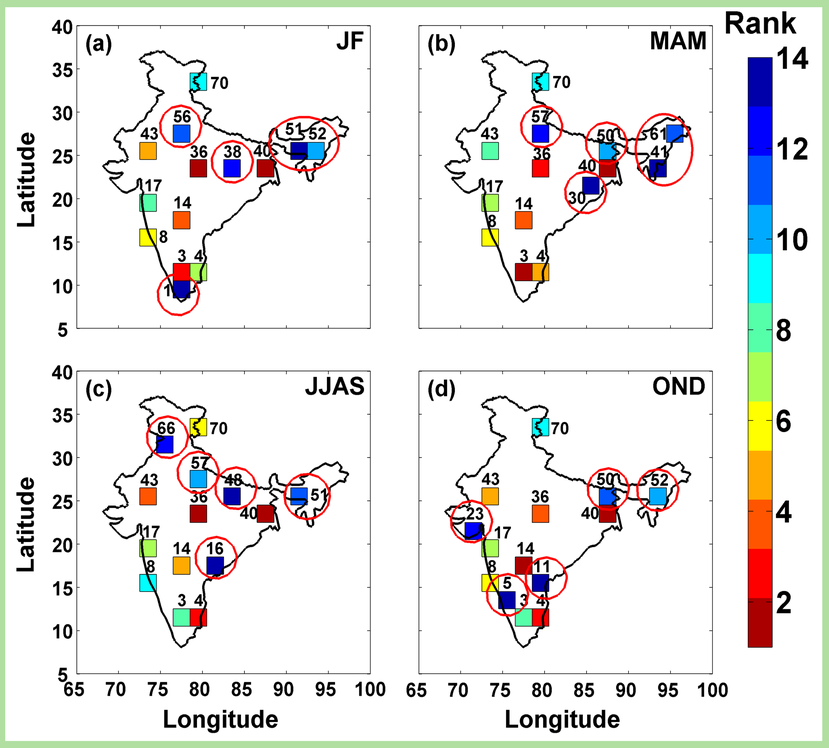


Uncertainty reduction and Optimal network

Reduction in the posterior uncertainty relative to the prior uncertainty resulted by the network of stations



Extended network of stations for different seasons according to the ranking



New network of stations proposed to constrain Indian land fluxes