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Interactive comment on "Wind extraction potential from 4D-Var assimilation of O_3, N_2O, and H_2O using a global shallow water model" *by* D. R. Allen et al.

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REVIEWER: Thomas Milewski, Canadian Meteorological Center

This article addresses the potential of analyzing the stratospheric wind flow by assimilating different trace gases in a simplified and idealized context. It builds upon previous research exploring the idea of wind extraction using chemical data assimilation, and provides new innovative material by showing the impact of assimilating different (passive) tracers in a more theoretical context than recent studies. It also offers an estimate of the maximum wind extraction potential (WEP, a new diagnostic, to

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the best of the reviewer's knowledge) that can be expected given certain set of parameters, which is interesting information for developing future data assimilation systems. The authors also provide informative comments on the limits and caveats of the idealized experiment settings, as well as giving some results sensitivity on the particular tracer/dynamical situation.

The reviewer only has minor comments: 1) p25296: "In the DAS algorithm, the horizontal flow is converted from the forecast model variables (vorticity and divergence) to zonal and meridional wind (u and v)". Can you provide some reasoning for this switch ? Have you tested the assimilation with vorticity and divergence ? The question comes up considering that you state in the Discussion section that correlations between tracers and potential vorticity may prove useful. 2) bottom of p25301: change to "where no random error is added to the observations"

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