

Interactive comment on “Quantifying pollution transport from the Asian monsoon anticyclone into the lower stratosphere” by Felix Ploeger et al.

Anonymous Referee #2

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Review of "Quantifying pollution transport from the Asian monsoon anticyclone into the lower stratosphere" by F.Ploeger et al.

The analyses of Ploeger et al., analyses the transport pathways from the Asian summer monsoon into the stratosphere using the Chemical Lagrangian Model of the Stratosphere (CLaMS). The CLaMS model is driven by ERA Interim climatologies and provides information on the transport of CO which is initialized by AIRS CO data at the lower boundary. In addition an artificial air mass origin tracer for the anticyclone is included into the model to provide information on the export of anticyclone air masses. This tracer is initialized in the monsoon upper troposphere between 370K-380K enclosed by a PV contour which represents the anticyclone. Importantly, the authors apply a tropopause based analysis, which avoids artificial cross tropopause transport signals from averaging over different tropopause heights (i.e. potential temperatures

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at the tropopause) and which also allows to distinguish between cross diabatic vertical transport and quasihorizontal transport. The authors show that vertical (cross isentropic) transport across the tropopause in the monsoon region is of high relevance and subsequent quasi-horizontal transport occurs to lower and higher latitudes. They further differentiate between the monsoon edge and the core and find that quasihorizontal transport from the monsoon edge on the short term is faster than transport from the core, but that both source regions follow the same transport pathways to the tropics or extratropics on the longer time scale. Particularly they quantify the potential contributions to the deeper branch of the Brewer-Dobson circulation and the shallow branch to be 5% and 15 %, respectively.

Currently a debate about the preferred pathways for pollution export from the anticyclone is going on. Thus the paper adds to this discussion and provides a very valuable insight into the potential pathways and partly mechanisms and thus is of high relevance. It quantifies the fractions of monsoon air, which are exported from the monsoon to the tropics as well as to the extratropics. The paper is well structured, fluently written and the methods are sound and I judge it as an excellent contribution to the field.

I recommend this paper almost as it is.

Minor remarks: p.5, l.31: What is meant with 'direct pathway'? I guess quasihorizontal roughly along isentropes from 380K-400K into the tropical tropopause region? p.5, l.33: Similarly: "...transported upwards in the monsoon and reaches the extratropical tropopause within a few days...": The monsoon tropopause is meant here with extratropical, please clarify. p.5, l.27: equator wards -> equatorwards

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