

Interactive comment on “The 1986–1989 ENSO cycle in a chemical climate model” by S. Brönnimann et al.

S. Brönnimann et al.

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Reply to Referee 2

1. Referee two suggests addressing the planetary wave structure in SOCOL more explicitly and not just in the mean difference between 1987 and 1989. This is a very good point. In the revised manuscript we add a new figure in which we show 100 hPa GPH at 50° N (Jan-Mar average) separately for 1987 and 1989 for each ensemble member as well as for ERA40. In fact, this plot allows a more detailed discussion of the achievements and drawbacks of the model. It shows that the planetary wave amplitudes are generally well reproduced. However, while the pattern is very well reproduced in the El Niño case, both S1 and S2 have difficulties reproducing the La Niña case. The plot also shows that SOCOL underestimates GPH at 50N at all longitudes. We have added some discussion.

2. It is true that 1989 is close to a solar max and 1987 close to a solar min. According to observational studies (Labitzke et al., 2006) one would expect a slightly stronger vortex in 1989 (as is observed). Note that both events occurred during the easterly QBO phase when the effect is more uncertain. We have added a sentence on this. In the SOCOL model, we used Judith Lean's solar data (we have added a sentence on this in Section 2). Steady-state SOCOL simulations for solar max and solar min conditions (without QBO) found that increased solar irradiance leads to a stronger polar vortex, but the signal was relatively weak and not statistically significant. In the revised manuscript, we add more information in this point.

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