show that these observations are reproduced by their chemistry–climate model, and that the variations, in particular, are visible in the modelled annual zonal mean anomalies. On the basis of the ENSO annual signal in both temperature and ozone, and its occurrence in the modelled zonal averages, Randel and colleagues plausibly propose that there must be a dynamical connection (Fig. 1) between the troposphere and stratosphere during ENSO. The detailed mechanisms of such dynamical connection will probably be debated in future investigations.

Randel and colleagues conclude that the effect of ENSO on lower stratospheric temperatures is a near-global effect. Independent confirmation of this conclusion comes from radiosonde observations[6] that extend the temperature analysis to include additional data sets and the seasonal dependence of the ENSO influence.

These deviations in stratospheric ozone and temperature provide firm evidence for an effect of ENSO at low and middle latitudes around the globe and up to considerable altitudes. The work highlights the ENSO signal in the stratosphere, but the findings may also shed light on global ENSO effects on the lower ranges of the atmosphere. Traditionally, the stratospheric dynamical state has been viewed as passively responding to disturbances that rise up from the troposphere, without much feedback down to the troposphere. Recognition is growing that this picture is too simple[9].

Any other tracer with a strong vertical gradient in the lower equatorial stratosphere should be affected similarly to the ozone concentrations. Further research is needed to determine the maximum altitude, the latitudinal extent and the seasonal variation of the ENSO signal in ozone and other tracers. And ENSO teleconnections in the southern stratosphere are still waiting to be explored.

A connection between ENSO and the stratosphere as reported by Randel and colleagues[1] is of practical interest: it could help to predict the remote effects of ENSO at the Earth's surface in some regions of the world, such as those bordering the North Atlantic Ocean[10,11]. It may be time to remove from our thinking the academic barrier of the tropopause and instead view the troposphere–stratosphere system as one intimately connected entity. ❐

Elisa Manzini is at the Centro Euro-Mediterraneo per i Cambiamenti Climatici and Istituto Nazionale di Geofisica e Vulcanologia, Viale Aldo Moro 44, 40127 Bologna, Italy.
e-mail: manzini@bo.ingv.it

References

1. Randel, W. J., Garcia, R. R., Calvo, N. & Marsh, D. *Geophys. Res. Lett.* **36,** L15822 (2009).
2. Reid, G. *J. Geophys. Res.* **99,** 18923–18932 (1994).
3. Calvo Fernandez, N. *et al. J. Clim.* **17,** 3934–3946 (2004).
4. Camp, C. D. & Tung, K.-K. *Geophys. Res. Lett.* **34,** L04809 (2007).
5. Garfinckel, C. I. & Hartmann, D. L. *J. Geophys. Res.* **113,** D18114 (2008).
6. Free, M. & Seidel, D. J. *J. Geophys. Res.* (in the press).
7. Manzini, E., Giorgetta, M. A., Esch, M., Kornblueh, L. & Roeckner, E. *J. Clim.* **19,** 3863–3881 (2006).
8. Brönnimann, S. *et al. Nature* **431,** 971–974 (2004).
9. Baldwin, M. P. & Dunkerton, T. J. *Science* **294,** 581–584 (2001).
10. Ineson, S. & Scaife, A. A. *Nature Geosci.* **2,** 32–36 (2009).
11. Cagnazzo, C. & Manzini, E. *J. Clim.* **22,** 1223–1238 (2009).

Correction

In the News & Views 'The dark side of marine carbon' (*Nature Geosci.* **2,** 603–604; 2009), the two occurrences of 'dissolved organic carbon' in the penultimate paragraph should have been 'dissolved inorganic carbon'. This error was corrected online in the HTML and PDF versions on 27 September 2009.