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ENSO-neutral conditions continued during September 2008, as sea surface temperatures (SSTs) in the east-central equatorial Pacific Ocean remained near-average (Fig. T18). The latest monthly SST index was -0.2°C in the Niño-3.4 region, and -0.4°C in the Niño-4 region (Table T2).

The oceanic thermocline, measured by the depth of the 20°C isotherm along the equator, featured shallower-than-average depths in the east-central equatorial Pacific during September (Figs. T15, T16). Consistent with this, equatorial oceanic temperatures at thermocline depth were 1-3 °C below average in the east-central equatorial Pacific (Fig. T17).

However, the atmospheric circulation continued to reflect some lingering aspects of La Niña, with enhanced low-level easterly winds and upper-level westerly winds over the western and central tropical Pacific (Figs. T20, T21, Table T1). Also, convection remained suppressed throughout the central equatorial Pacific and enhanced over Indonesia (Figs. T25, T26 and E3).

For the latest status of the ENSO cycle see the ENSO Diagnostic Discussion at:
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TABLE T1 - Atmospheric index values for the most recent 12 months. Indices are standardized by the mean annual standard deviation, except for the Tahiti and Darwin SLP anomalies which are in units of hPa. Positive (negative) values of 200-hPa zonal wind index imply westerly (easterly) anomalies. Positive (negative) values of 850-hPa zonal wind indices imply easterly (westerly) anomalies.
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TABLE T2. Mean and anomalous sea surface temperature (°C) for the most recent 12 months. Anomalies are departures from the 1971-2000 adjusted OI climatology (Smith and Reynolds 1998, J. Climate, 11, 3320-3323).
FIGURE T1. Five-month running mean of the Southern Oscillation Index (SOI) (top), sea-level pressure anomaly (hPa) at Darwin and Tahiti (middle), and outgoing longwave radiation anomaly (OLR) averaged over the area 5N-5S, 160E-160W (bottom). Anomalies in the top and middle panels are departures from the 1951-1980 base period means and are normalized by the mean annual standard deviation. Anomalies in the bottom panel are departures from the 1979-1995 base period means. Individual monthly values are indicated by “x”s in the top and bottom panels. The x-axis labels are centered on July.
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September 2008

Divergence and West–East Divergent Circulation

Mean

Anomaly

FIGURE T30. Pressure-longitude section (80W-100E) of the mean (top) and anomalous (bottom) divergence (contour interval is $1 \times 10^{-6}$ s$^{-1}$) and divergent circulation averaged between 5N-5S. The divergent circulation is represented by vectors of combined pressure vertical velocity and the divergent component of the zonal wind. Red shading and solid contours denote divergence (top) and anomalous divergence (bottom). Blue shading and dashed contours denote convergence (top) and anomalous convergence (bottom). Anomalies are departures from the 1979-1995 base period monthly means.
FIGURE T31. Pressure-latitude section of the mean (top) and anomalous (bottom) zonal wind (m s\(^{-1}\)) and divergent circulation averaged over the west Pacific sector (120E-170E). The divergent circulation is represented by vectors of combined pressure vertical velocity and the divergent component of the meridional wind. Red shading and solid contours denote a westerly (top) or anomalous westerly (bottom) zonal wind. Blue shading and dashed contours denote an easterly (top) or anomalous easterly (bottom) zonal wind. Anomalies are departures from the 1979-1995 base period monthly means.
FIGURE T32. Pressure-latitude section of the mean (top) and anomalous (bottom) zonal wind (m s\(^{-1}\)) and divergent circulation averaged over the central Pacific sector (130W-180W). The divergent circulation is represented by vectors of combined pressure vertical velocity and the divergent component of the meridional wind. Red shading and solid contours denote a westerly (top) or anomalous westerly (bottom) zonal wind. Blue shading and dashed contours denote an easterly (top) or anomalous easterly (bottom) zonal wind. Anomalies are departures from the 1979-1995 base period monthly means.
During September 2008, 353 satellite-tracked surface drifting buoys, 85% with subsurface drogues attached for measuring mixed layer currents, were reporting from the tropical Pacific. Westward anomalies of 10-20 cm/s were measured by several drifters in the SEC at 140-180W, 2-8S. A few drifters in the eastern NECC revealed eastward anomalies of 20 cm/s, but the robustness of this is unclear. Elsewhere, currents were near their climatological September strength. Across most of the basin, SSTs were near or slightly cooler than their typical September values, with cold anomalies of -0.5 to -1.5C most common between 140W and the dateline. Warm anomalies of +0.5 to +3.0C were measured by many drifters in the northwest corner of the basin (west of 180, north of 10N) as seen last month.

**Figure A1.1 Top:** Movements of drifting buoys in the tropical Pacific Ocean during September 2008. The linear segments of each trajectory represent a one week displacement. Trajectories of buoys which have lost their subsurface drogues are gray; those with drogues are black.

**Middle:** Monthly mean currents calculated from all buoys 1993-2002 (gray), and currents measured by the drogued buoys this month (black) smoothed by an optimal filter.

**Bottom:** Anomalies from the climatological monthly mean currents for this month.
FIGURE A1.2. Wind Vectors and sea surface temperature (SSTs) from the TAO/TRITON mooring array. Top panel shows monthly means; bottom panel shows monthly anomalies from the COADS wind climatology and Reynolds SST climatology (1971-2000). The TAO/TRITON array is presently supported by the United States (NOAA), Japan (STA), and France (IRD). Further information is available from Richard L. Crout (NOAA/NDBC).
FIGURE A1.3. Time-longitude sections of surface zonal winds (m s\(^{-1}\)), sea surface temperature (\(\degree C\)) and 20\(\degree C\) isotherm depth (m) for the past 24 months. Analysis is based on 5-day averages of moored time series data from the TAO/TRITON array. Positive winds are westerly. Squares on the abscissas indicate longitude where data were available at the start of the time series (top) and end of the time series (bottom). The TAO/TRITON array is presently supported by the United States (NOAA), Japan (STA), and France (IRD). Further information is available from Richard L. Crout (NOAA/NDBC).
FIGURE A1.4. Time-longitude sections of surface zonal winds (m s\(^{-1}\)), sea surface temperature (C) and 20°C isotherm depth (m) for the past 24 months. Analysis is based on 5-day averages of moored time series data from the TAO/TRITON array. Anomalies are relative to monthly climatological cubic spline fitted to 5-day intervals (COADS winds, Reynolds SST, CTD/XBT 20°C depth). Positive winds are westerly. Squares on the abscissas indicate longitude where data were available at the start of the time series (top) and end of the time series (bottom). The TAO/TRITON array is presently supported by the United States (NOAA), Japan (STA), and France (IRD). Further information is available from Richard L. Crout (NOAA/...
In cooperation with institutions in Peru and Ecuador, NOAA-AOML maintained a network of coastal stations reporting SST and sea level in real time (via satellite downlink) during the TOGA program, from 1985 to 1995. The South American partners took over full operational responsibility thereafter, while NOAA-AOML assumed a data management role, continuing publication of these monthly reports along with their partners. The five-day averages (pentads) at critical stations give us an effective means of monitoring coastal conditions with good time resolution and compact data volume.

A warm episode in the Nino 1+2 region seems to have run its course after 2-3 months. Coastal SST and sea level anomalies are clearly on a downward trend and entering negative territory once again. The time scales of these fluctuations is greater that that of the MJO-related Kelvin waves, so it appears we may be entering a somewhat prolonged period of cooler SSTs in the eastern Pacific.

** - Data missing due to hardware failure
FIGURE A1.6.
FSU Surface Pseudo-Stress Vectors and Anomalies: September 2008. Pseudo-stress vectors (top) are objectively analyzed from ship and buoy winds on a 2° grid. Ship and buoy data are independently weighted and the background field is created from the data. Contour interval of the vector magnitudes is 20 M S⁻¹. Anomalies (bottom) are departures from 1978–2001 mean. The contour interval is 10 M S⁻¹. For more information, please visit our web site at http://www.coaps.fsu.edu/RVSMDC/html/winds.shtml. Produced by Jeremy Rolph, Mark A. Bourassa, and Shawn R. Smith, Center for Ocean-Atmospheric Prediction Studies, Florida State University, Tallahassee, FL 32306–2240, USA.
Forecast Forum

The canonical correlation analysis (CCA) forecast of SST in the central Pacific (Barnett et al. 1988, Science, 241, 192196; Barnston and Ropelewski 1992, J. Climate, 5, 13161345), is shown in Figs. F1 and F2. This forecast is produced routinely by the Prediction Branch of the Climate Prediction Center. The predictions from the National Centers for Environmental Prediction (NCEP) Coupled Forecast System Model (CFS03) are presented in Figs. F3 and F4a, F4b. Predictions from the Markov model (Xue, et al. 2000: J. Climate, 13, 849871) are shown in Figs. F5 and F6. Predictions from the latest version of the LDEO model (Chen et al. 2000: Geophys. Res. Let., 27, 25852587) are shown in Figs. F7 and F8. Predictions using linear inverse modeling (Penland and Magorian 1993: J. Climate, 6, 10671076) are shown in Figs. F9 and F10. Predictions from the Scripps / Max Planck Institute (MPI) hybrid coupled model (Barnett et al. 1993: J. Climate, 6, 15451566) are shown in Fig. F11. Predictions from the ENSOCLIPER statistical model (Knaff and Landsea 1997, Wea. Forecasting, 12, 633652) are shown in Fig. F12. Niño 3.4 predictions are summarized in Fig. F13, provided by the Forecasting and Prediction Research Group of the IRI.

The CPC and the contributors to the Forecast Forum caution potential users of this predictive information that they can expect only modest skill.

Outlook

ENSO-neutral conditions are expected to continue into early 2009.

Discussion

ENSO-neutral conditions continued during September 2008, as sea surface temperatures (SSTs) remained near-average in the east-central equatorial Pacific Ocean. SSTs remained slightly below-average in the central Pacific, and slightly above-average in the eastern Pacific (Fig. T18). From west to east, the monthly SST index values range from “0.4°C in the Niño-4 region to +0.7°C in the Niño 1+2 region (Table T2). The subsurface oceanic heat content (average temperatures in the upper 300m of the ocean) continued to decrease in response to the strengthening of negative temperature anomalies at thermocline depth in the east-central Pacific (Fig. T17).

Although ENSO-neutral conditions have been in place since June 2008, the atmospheric circulation over the western and central tropical Pacific continues to reflect lingering aspects of La Niña. The MJO
accentuated this signal during early-to-mid September, and suppressed it during the latter part of the month. The combined monthly average signal featured enhanced low-level easterly winds and upper-level westerly winds in the central Pacific (Figs. T20 and T21), with convection enhanced over Indonesia and suppressed over the central Pacific (Fig. T25). Overall, the ocean-atmosphere system remains consistent with ENSO-neutral conditions.

Most of the dynamical and statistical SST forecasts for the Niño 3.4 region indicate a continuation of ENSO-neutral conditions (≈0.5°C to 0.5°C in the Niño-3.4 region) into the first half of 2009 (Figs. F1-F13). While the model spread continues to include possibilities ranging from El Niño to La Niña, the recent decrease in subsurface and surface temperatures favors a return to La Niña over the development of El Niño. However, based on current atmospheric and oceanic conditions, recent trends, and model forecasts, ENSO-neutral conditions are expected to continue into early 2009.

Weekly updates of oceanic and atmospheric conditions are available on the Climate Prediction Center homepage (El Niño/La Niña Current Conditions and Expert Discussions).
FIGURE F1. Canonical correlation analysis (CCA) sea surface temperature (SST) anomaly prediction for the central Pacific (5°N to 5°S, 120°W to 170°W (Barnston and Ropelewski, 1992, *J. Climate*, 5, 1316-1345). The three plots on the left hand side are, from top to bottom, the 1-season, 2-season, and 3-season lead forecasts. The solid line in each forecast represents the observed SST standardized anomaly through the latest month. The small squares at the mid-points of the forecast bars represent the real-time CCA predictions based on the anomalies of quasi-global sea level pressure and on the anomalies of tropical Pacific SST, depth of the 20°C isotherm and sea level height over the prior four seasons. The vertical lines represent the one standard deviation error bars for the predictions based on past performance. The three plots on the right side are skills, corresponding to the predicted and observed SST. The skills are derived from cross-correlation tests from 1956 to present. These skills show a clear annual cycle and are inversely proportional to the length of the error bars depicted in the forecast time series.
FIGURE F2. Canonical Correlation Analysis (CCA) forecasts of sea-surface temperature anomalies for the Nino 3.4 region (5N-5S, 120W-170W) for the upcoming five consecutive 3-month periods. Forecasts are expressed as standardized SST anomalies. The CCA predictions are based on anomaly patterns of SST, depth of the 20°C isotherm, sea level height, and sea level pressure. Small squares at the midpoints of the vertical forecast bars represent the CCA predictions, and the bars show the one (thick) and two (thin) standard deviation errors. The solid continuous line represents the observed standardized three-month mean SST anomaly in the Nino 3.4 region up to the most recently available data.
FIGURE F3. Predicted 3-month average sea surface temperature (left) and anomalies (right) from the NCEP Coupled Forecast System Model (CFS03). The forecasts consist of 40 forecast members. Contour interval is 1°C, with additional contours for 0.5°C and -0.5°C. Negative anomalies are indicated by dashed contours.
FIGURE F4. Predicted and observed sea surface temperature (SST) anomalies for the Nino 3 (top) and Nino 3.4 (bottom) regions from the NCEP Coupled Forecast System Model (CFS03). The forecasts consist of 40 forecast members. The ensemble mean of all 40 forecast members is shown by the blue line, individual members are shown by thin lines, and the observation is indicated by the black line. The Nino-3 region spans the eastern equatorial Pacific between 5N-5S, 150W-90W. The Nino 3.4 region spans the east-central equatorial Pacific between 5N-5S, 170W-120W.
FIGURE F5. Predicted 3-month average sea surface temperature anomalies from the NCEP/CPC Markov model (Xue et al. 2000, *J. Climate*, 13, 849-871). The forecast is initiated in SEP 2008. Contour interval is 0.3°C and negative anomalies are indicated by dashed contours. Anomalies are calculated relative to the 1971-2000 climatology.
FIGURE F6. Time evolution of observed and predicted SST anomalies in the Nino 3.4 region (up to 12 lead months) by the NCEP/CPC Markov model (Xue et al. 2000, *J. Climate*, 13, 849-871). Anomalies are calculated relative to the 1971-2000 climatology. Shown in each panel are the forecasts grouped by three consecutive starting months: (a) is for December, January, and February, (b) is for March, April, and May, (c) is for June, July, and August, and (d) is for September, October, and November. The observed Nino 3.4 SST anomalies are indicated by the black dashed lines. The Nino 3.4 region spans the east-central equatorial Pacific between 5N-5S, 170W-120W.
FIGURE F7. Forecasts of the tropical Pacific Predicted SST (shading) and vector wind anomalies for the next 3 seasons based on the LDEO model. Each forecast represents an ensemble average of 3 sets of predictions initialized during the last three consecutive months (see Figure F8).
FIGURE F8. LDEO forecasts of SST anomalies for the Nino 3 region using wind stresses obtained from (top) QuikSCAT, (middle) NCEP, and (bottom) Florida State Univ. (FSU), along with SSTs (obtained from NCEP), and sea surface height data (obtained from TOPEX/POSEIDON) data. Each thin blue line represents a 12-month forecast, initialized one month apart for the past 24 months. Observed SST anomalies are indicated by the thick red line. The Nino-3 region spans the eastern equatorial Pacific between 5N-5S, 150W-90W.
FIGURE F9. Forecast of tropical SST anomalies from the Linear Inverse Modeling technique of Penland and Magorian (1993: *J. Climate*, 6, 1067-1076). The contour interval is 0.3°C. Anomalies are calculated relative to the 1951-2000 climatology and are projected onto 20 leading EOFs.
FIGURE F10. Predictions of SST anomalies in the Nino3.4 region (blue line) for leads of three months (top) to 12 months (bottom), from the Linear Inverse Modeling technique of Penland and Magorian (1993: *J. Climate*, 6, 1067-1076). Observed SST anomalies are indicated by the red line. Anomalies are calculated relative to the 1951-2000 climatology and are projected onto 20 leading EOFs. The Nino 3.4 region spans the east-central equatorial Pacific between 5N-5S, 170W-120W.
FIGURE F11. SST anomaly forecast for the equatorial Pacific from the Hybrid Coupled Model (HCM) developed by the Scripps Institution of Oceanography and the Max-Plank Institut fuer Meteorologie.
FIGURE F12. ENSO-CLIPER statistical model forecasts of three-month average sea surface temperature anomalies (green lines, deg. C) in (top panel) the Nino 4 region (5N-5S, 160E-150W), (second panel) the Nino 3.4 region (5N-5S, 170W-120W), (third panel) the Nino 3 region (5N-5S, 150W-90W), and (fourth panel) the Nino 1+2 region (0-10S, 90W-80W) (Knaff and Landsea 1997, Wea. Forecasting, 12, 633-652). Bottom panel shows predictions of the three-month standardized Southern Oscillation Index (SOI, green line). Horizontal bars on green line indicate the adjusted root mean square error (RMSE). The Observed three-month average values are indicated by the thick blue line. SST anomalies are departures from the 1971-2000 base period means, and the SOI is calculated from the 1951-1980 base period means.
FIGURE F13. Time series of predicted sea surface temperature anomalies for the Nino 3.4 region (deg. C) from various dynamical and statistical models for nine overlapping 3-month periods. The Nino 3.4 region spans the east-central equatorial Pacific between 5N-5S, 170W-120W. Figure provided by the International Research Institute (IRI).
Extratropical Highlights – September 2008

1. Northern Hemisphere

   The 500-hPa height pattern during September 2008 featured positive anomalies from northeastern Canada to Scandinavia, and over the high latitudes of the central North Pacific, and negative anomalies across southern Europe (Fig. E9). During September, surface temperatures were above average in much of eastern North America, western Scandinavia, and the Middle East, and below-average in the south-central U.S. (Fig. E1). Rainfall was above average in the central and eastern U.S. and Gulf Coast, and portions of southeastern Europe, and below average in Alaska, western Canada, Scandinavia, and northeastern Europe (Fig. E3)

   a. North Pacific/ North America

      The mean 500-hPa circulation during September featured a fairly non-descript pattern of above-average heights over eastern Canada. However, there was significant variability during the month in response to three U.S. landfalling hurricanes, which included Major Hurricane Gustav in Louisiana, Hurricane Hanna in South Carolina, and Major Hurricane Ike in Texas. These combined systems contributed to above-average precipitation in the Midwest, Gulf Coast, and eastern U.S. Additionally, the mid-Atlantic and northeastern states experienced many days of heavy precipitation in association with a strong extratropical storm.

   b. Europe

      The 500-hPa circulation featured above-average heights across Scandinavia and below-average heights across southern Europe, in association with the positive phase of the NAO (Table E1). This marks a significant departure from the strong negative NAO pattern that prevailed during the past five months. Consistent with this change, northern Europe recorded average to below-average precipitation during September, while southern Europe recorded average to above-average precipitation (Figs. E3, E4).
2. Southern Hemisphere

The 500-hPa height field during September featured an anomalous zonal wave-3 pattern, with above-average heights centered east of New Zealand, east of South America, and over the central Indian Ocean, and below-average heights over the high latitudes of the eastern South Pacific, and south of both Africa and Australia (Fig. E15). No significant temperature or precipitation anomalies were observed over the SH land masses in September.
TABLE E1-Standardized amplitudes of selected Northern Hemisphere teleconnection patterns for the most recent thirteen months (computational procedures are described in Fig. E7). Pattern names and abbreviations are: North Atlantic Oscillation (NAO); East Atlantic pattern (EA); West Pacific pattern (WP); East Pacific - North Pacific pattern (EP-NP); Pacific/North American pattern (PNA); Tropical/Northern Hemisphere pattern (TNH); East Atlantic/Western Russia pattern (EATL/WRUS-called Eurasia-2 pattern by Barnston and Livezey, 1987, *Mon. Wea. Rev.*, 115, 1083-1126); Scandanavia pattern (SCAND-called Eurasia-1 pattern by Barnston and Livezey 1987); and Polar Eurasia pattern (POLEUR). No value is plotted for calendar months in which the pattern does not appear as a leading mode.
FIGURE E1. Surface temperature anomalies (°C, top) and surface temperature expressed as percentiles of the normal (Gaussian) distribution fit to the 1971–2000 base period data (bottom) for SEP 2008. Analysis is based on station data over land and on SST data over the oceans (top). Anomalies for station data are departures from the 1971–2000 base period means, while SST anomalies are departures from the 1971–2000 adjusted OI climatology. (Smith and Reynolds 1998, J. Climate, 11, 3320-3323). Regions with insufficient data for analysis in both figures are indicated by shading in the top figure only.
FIGURE E2. Monthly global (top), Northern Hemisphere (middle), and Southern Hemisphere (bottom) surface temperature anomalies (land only, °C) from January 1990 - present, computed as departures from the 1971–2000 base period means.
FIGURE E3. Anomalous precipitation (mm, top) and precipitation percentiles based on a Gamma distribution fit to the 1979–2000 base period data (bottom) for SEP 2008. Data are obtained from a merge of raingauge observations and satellite-derived precipitation estimates (Janowiak and Xie 1999, J. Climate, 12, 3335–3342). Contours are drawn at 200, 100, 50, 25, -25, -50, -100, and -200 mm in top panel. Percentiles are not plotted in regions where mean monthly precipitation is <5mm/month.
FIGURE E4. Areal estimates of monthly mean precipitation amounts (mm, solid lines) and precipitation percentiles (%), bars) for the most recent 13 months obtained from a merge of raingauge observations and satellite-derived precipitation estimates (Janowiak and Xie 1999, *J. Climate*, 12, 3335–3342). The monthly precipitation climatology (mm, dashed lines) is from the 1979–2000 base period monthly means. Monthly percentiles are not shown if the monthly mean is less than 5 mm.
FIGURE E5. Areal estimates of monthly mean precipitation amounts (mm, solid lines) and precipitation percentiles (%e, bars) for the most recent 13 months obtained from a merge of raingauge observations and satellite-derived precipitation estimates (Janowiak and Xie 1999, J. Climate, 12, 3335–3342). The monthly precipitation climatology (mm, dashed lines) is from the 1979–2000 base period monthly means. Monthly percentiles are not shown if the monthly mean is less than 5 mm.
FIGURE E6. Observed precipitation (upper left), departure from average (upper right), percent of average (lower left), and average precipitation (lower right) for SEP 2008. The units are given on each panel. Base period for averages is 1971–2000. Results are based on CPC’s U. S. daily precipitation analysis, which is available at http://www.cpc.ncep.noaa.gov/products/precip/realtime.
FIGURE E7. Standardized monthly Northern Hemisphere teleconnection indices. The teleconnection patterns are calculated from a Rotated Principal Component Analysis (RPCA) applied to monthly standardized 500-hPa height anomalies during January 1950 – December 2000. To obtain these patterns, ten leading un-rotated modes are first calculated for each calendar month by using the monthly height anomaly fields for the three-month period centered on that month: [i.e., The July modes are calculated from the June, July, and August standardized monthly anomalies]. A Varimax spatial rotation of the ten leading un-rotated modes for each calendar month results in 120 rotated modes (12 months x 10 modes per month) that yield ten primary teleconnection patterns. The teleconnection indices are calculated by first projecting the standardized monthly anomalies onto the teleconnection patterns corresponding to that month (eight or nine teleconnection patterns are seen in each calendar month). The indices are then solved for simultaneously using a Least-Squares approach. In this approach, the indices are the solution to the Least-Squares system of equations which explains the maximum spatial structure of the observed height anomaly field during the month. The indices are then standardized for each pattern and calendar month independently. No index value exists when the teleconnection pattern does not appear as one of the ten leading rotated EOF’s valid for that month.
FIGURE E8. Northern Hemisphere mean and anomalous sea level pressure (CDAS/Reanalysis) for SEP 2008. Mean values are denoted by solid contours drawn at an interval of 4 hPa. Anomaly contour interval is 2 hPa with values less (greater) than -2 hPa (2 hPa) indicated by dark (light) shading. Anomalies are calculated as departures from the 1979-95 base period monthly means.
FIGURE E9. Northern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis) for SEP 2008. Mean heights are denoted by solid contours drawn at an interval of 6 dam. Anomaly contour interval is 3 dam with values less (greater) than -3 dam (3 dam) indicated by dark (light) shading. Anomalies are calculated as departures from the 1979-95 base period monthly means.
FIGURE E10. Northern Hemisphere mean (left) and anomalous (right) 300-hPa vector wind (CDAS/Reanalysis) for SEP 2008. Mean (anomaly) isotach contour interval is 10 (5) m s$^{-1}$. Values greater than 30 m s$^{-1}$ (left) and 10 m s$^{-1}$ (right) are shaded. Anomalies are departures from the 1979-95 base period monthly means.
FIGURE E11. Northern Hemisphere percentage of days during SEP 2008 in which 500-hPa height anomalies greater than 15 m (red) and less than -15 m (blue) were observed. Values greater than 70% are shaded and contour interval is 20%.
FIGURE E12. Northern Hemisphere: Daily 500-hPa height anomalies for SEP 2008 averaged over the 5° latitude band centered on 40°N. Positive values are indicated by solid contours and dark shading. Negative values are indicated by dashed contours and light shading. Contour interval is 60 m. Anomalies are departures from the 1979-95 base period daily means.
FIGURE E13. Northern Hemisphere: 700-hPa heights for SEP 2008 overlaid with standard deviation of high-pass filtered height (left) and normalized anomalous variance of high-pass filtered height (right). Heights are indicated by thick solid contours in both panels (interval is 60 m). High-pass filtered fields reflect fluctuations having periods less than 10 days, and are indicated by thin contours and shading. Contour interval for standard deviation is 15 m with values > 45 m shaded. Contour interval for normalized variance is 1 standard deviation, with positive values shown by solid contours and dark shading and negative values shown by dashed contours and light shading. Anomalies are departures from the 1964-93 base period monthly means.
FIGURE E14. Southern Hemisphere mean and anomalous sea level pressure (CDAS/Reanalysis) for SEP 2008. Mean values are denoted by solid contours drawn at an interval of 4 hPa. Anomaly contour interval is 2 hPa with values less (greater) than -2 hPa (2 hPa) indicated by dark (light) shading. Anomalies are calculated as departures from the 1979-95 base period monthly means.
FIGURE E15. Southern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis) for SEP 2008. Mean heights are denoted by solid contours drawn at an interval of 6 dam. Anomaly contour interval is 3 dam with values less (greater) than -3 dam (3 dam) indicated by dark (light) shading. Anomalies are calculated as departures from the 1979-95 base period monthly means.
FIGURE E16. Southern Hemisphere mean (left) and anomalous (right) 300-hPa vector wind (CDAS/Reanalysis) for SEP 2008. Mean (anomaly) isotach contour interval is 10 (5) ms$^{-1}$. Values greater than 30 ms$^{-1}$ (left) and 10 ms$^{-1}$ (right) are shaded. Anomalies are departures from the 1979-95 base period monthly means.
FIGURE E17. Southern Hemisphere percentage of days during SEP 2008 in which 500-hPa height anomalies greater than 15 m (red) and less than -15 m (blue) were observed. Values greater than 70% are shaded and contour interval is 20%.
FIGURE E18. Southern Hemisphere: Daily 500-hPa height anomalies for SEP 2008 averaged over the 5° latitude band centered on 40°S. Positive values are indicated by solid contours and dark shading. Negative values are indicated by dashed contours and light shading. Contour interval is 60 m. Anomalies are departures from the 1979-95 base period daily means.
FIGURE S1. Stratospheric height anomalies (m) at selected levels for SEP 2008. Positive values are indicated by solid contours and dark shading. Negative values are indicated by dashed contours and light shading. Contour interval is 60 m. Anomalies are calculated from the 1979–95 base period means. Winter Hemisphere is shown.
FIGURE S2. Height-longitude sections during SEP 2008 for height anomalies (contour) and temperature anomalies (shaded). In both panels, positive values are indicated by solid contours and dark shading, while negative anomalies are indicated by dashed contours and light shading. Contour interval for height anomalies is 60 m and for temperature anomalies is 2°C. Anomalies are calculated from the 1979–95 base period monthly means. Winter Hemisphere is shown.
Zonal Mean Temperature for 2007 & 2008

FIGURE S4. Daily mean temperatures at 10-hPa and 2-hPa (thick line) in the region 65°–90°N and 65°–90°S for the past two years. Dashed line depicts the 1979–99 base period daily mean. Thin solid lines depict the daily extreme maximum and minimum temperatures.
FIGURE S5. Monthly ozone anomalies (percent) from the long term monthly means for five zones: 50N-30N (NH mid-latitudes), 25N-10N (NH tropical surf zone), 10N-10S (Equatorial-QBO zone), 10S-25S (SH tropical surf zone), and 30S-50S (SH mid-latitudes). The long term monthly means are determined from the entire data set beginning in 1979.
FIGURE S6. Northern (top) and Southern (bottom) Hemisphere total ozone anomaly (percent difference from monthly mean for the period 1979–86). The region near the winter pole has no SBUV/2 data.
FIGURE S7. Daily vertical component of EP flux (which is proportional to the poleward transport of heat or upward transport of potential energy by planetary wave) at 100 hPa averaged over (top) 30°N–90°N and (bottom) 30°S–90°S for SEP 2008. The EP flux unit (kg m⁻¹ s⁻²) has been scaled by multiplying a factor of the Brunt Vaisala frequency divided by the Coriolis parameter and the radius of the earth. The letter ‘M’ indicates the current monthly mean value and the letter ‘C’ indicates the climatological mean value. Additionally, the normalized departures from the monthly climatological EP flux values are shown.
FIGURE S8. Daily time series showing the size of the NH polar vortex (representing the area enclosed by the 32 PVU contour on the 450K isentropic surface), and the areal coverage of temperatures < -78C on the 450K isentropic surface.
FIGURE A2.1. (a) Daily amplitudes of the Arctic Oscillation (AO) the North Atlantic Oscillation (NAO), and the Pacific-North American (PNA) pattern. The pattern amplitudes for the AO, (NAO, PNA) are calculated by projecting the daily 1000-hPa (500-hPa) height anomaly field onto the leading EOF obtained from standardized time-series of daily 1000-hPa (500-hPa) height for all months of the year. The base period is 1979–2000.

(b-d) Northern Hemisphere mean and anomalous 500-hPa geopotential height (CDAS/Reanalysis) for selected periods during SEP 2008 are shown in the remaining 3 panels. Mean heights are denoted by solid contours drawn at an interval of 8 dam. Dark (light) shading corresponds to anomalies greater than 50 m (less than -50 m). Anomalies are calculated as departures from the 1979–95 base period daily means.
FIGURE A2.2. SSM/I derived snow cover frequency (%) (left) and snow cover anomaly (%) (right) for the month of SEP 2008 based on 1987 - 2006 base period for the Northern Hemisphere (top) and Southern Hemisphere (bottom). It is generated using the algorithm described by Ferraro et. al, 1996, Bull. Amer. Meteor. Soc., vol 77, 891-905.