

Resent-From: <jkenyon@ALBANY.EDU>
From: "Bosart, Lance F" <lbosart@ALBANY.EDU>
Subject: **Synopsis of Friday map discussion for 26 April 2013**
Date: 30 April 2013 12:22:52 AM EDT
To: <MAP@listserv.albany.edu>
Reply-To: "Bosart, Lance F" <lbosart@ALBANY.EDU>

Hi Everyone,

The focus of Friday map discussion for 26 April 2013 was on: 1) the large-scale NH flow patterns associated with the belated arrival of spring over North America, 2) the moderate/large-amplitude inertia-gravity wave (IGW) event of 11 April 2013 over the upper Midwest, and 3) the forecast of a major pattern change over North America that would end the prolonged period of below normal temperatures over the Midwest and parts of the East. Alicia Bentley, Philippe Papin and Jaymes Kenyon assisted in the preparation of map discussion images and loops that can be found here: <http://www.atmos.albany.edu/student/ppapin/mapdisco/20130426/>

I. NH large-scale flow patterns for 1-23 April 2013:

An animation matrix of NH mean and anomaly 1000/300 hPa heights, and 850 hPa temperatures for 1-23 April 2013 (source: NOSAA/ESRL/PSD) can be found here : <http://www.atmos.albany.edu/student/ppapin/mapdisco/20130426/images/psd.html>. See also assorted large-scale synoptic analyses available at the master map discussion web link.

The animation matrix shows the persistent anomalous 1000/300 hPa ridges over the eastern Pacific and western Atlantic that sandwich a 1000 hPa surface trough (storm track) that runs from Texas to Labrador and along which multiple storms progressed northeastward bring repeated snowstorms from the Rockies eastward to the Central and Upper Midwest. Storm-track baroclinicity was enhanced by positive 1000 hPa height anomalies from the southern Plains northwestward to Alaska to the east of the Rockies, a situation that enabled repeated outbreaks of cold air to be channeled equatorward east of the Rockies to northern Mexico and beyond (see the mean and anomaly 850 hPa temperature field).

A science issue is what physical processes combined to "lock-in" the observed persistent storm track east of the Rockies. This storm track was associated with many all-time monthly snowfall records (e.g., at Duluth, MN with > 50 inches) and shows signs of one last hurrah event from the COWY area northeastward to the upper Midwest on 30 April and 1 May. The persistence of the snow and cold despite a rapidly increasing solar elevation angle would appear to be a good test of the relative importance of dynamical (e.g., chaotic midlatitude forcing vs remote tropical forcing) versus regional thermodynamical forcing (e.g., increased albedo from widespread spring snow cover) on the structure and evolution of the large-scale patterns, a spring transition situation envisioned by Jerry Namias many decades ago.

II. Moderate-large-amplitude IGW event of 11 April 2013 over the upper Midwest:

Discussion of this event on the map listserv was initiated by Kyle Griffin two weeks ago. Assorted sub links that contain details of the IGW structure and evolution are available at the master map discussion link for 26 April given above. My synoptic synopsis of the event from an earlier post to Kyle Griffin is as follows (see the master Fri map discussion link for access to supporting sub links): "HRRR BREF loop suggests strongly diffluent flow is present from the MN/IA border eastward across southern WI.....implies a W-E dilatation axis and frontogenetical forcing in the region. 700 hPa Q-vector analysis for 0000 UTC 11 April supports del dot Q < 0 over the region. Q vectors point toward warmer air....indicative of frontogenesis....over there eastern part of the region. DVN/GRB soundings from 0000 UTC 11 Apr both indicate the presence of a low-level wave duct with steep lapse rates above where a critical layer likely resides based upon the observed wind profiles. Kyle's loop of 500 hPa Z/T/V suggest a collapse of the downstream half wavelength between 0000-1200 UTC 11 Apr as a short wave trough swings northward from KS/OK to southern MN while an NW-SE oriented ridge axis remains quasi stationary from extreme eastern Manitoba SE to the Ohio Valley (classic downstream confluence north of the eastern Great Lakes looks like it helps to provide the anchor for the ridge axis). A 1030+ hPa anticyclone north of Lake Superior in the poleward entrance region of the aforementioned confluent jet entrance region provides the low-level cold air source that sets up the wave duct."

This case appears to indicate that a low-level stable layer, a necessary condition for supporting a wave duct, can form from the equatorward advection of shallow cold air over snow-covered ground toward the surface warm front. This is the best example I have seen of this likely mechanism for low-level duct formation prior to IGW formation and propagation and is worthy for further analysis and scientific investigation. The equatorward movement of surface cold air over snow-covered ground was assisted greatly by a thermally direct circulation in the entrance region of a short, stubby jet that stretched eastward from north of the Great Lakes to Labrador in a broad confluent jet-entrance region that featured a 1030+ hPa surface anticyclone in the poleward entrance region of this jet.

III. Upcoming large-scale flow pattern rearrangement over North America and the rapid onset of spring in many locations of the central and eastern US:

Map discussion concluded with a first look at GFS/ECMWF forecasts from 1200 UTC 26 April 2013 which suggested that blocking pattern would become established over much of the CONUS after 1 May in conjunction with a poleward shift of the westerlies into Canada, a corresponding weakening of the upper-level flow over the CONUS, and a trapped cutoff cyclone over the southern Plains and Midwest. The forecast flow transition was remarkable and begs the question as to what were the key dynamical and thermodynamical players in the forecast flow transition which is well underway as of this writing.

By longstanding tradition, Next week the last regularly scheduled Friday map discussion of the semester will be organized and led by the students.

Lance

To unsubscribe from the MAP list, click the following link and send the email generated:
MAP-SIGNOFF-REQUEST@LISTSERV.ALBANY.EDU