Hi all,

Friday map discussion resumed last week. Discussion topics can be found here: http://www.atmos.albany.edu/mapdisco/20160909/ (remove 20160909 to get the generic Friday map discussion link). Kyle Pallozzi and Tomer Burg assisted with the discussion.

We reviewed meteorological summer (JJA) 2016 for the NH, SH, and Tropics. The operative story (no surprise) was widespread anomalous warmth across the NH and Tropics, and a somewhat unremarkable winter in the SH that featured anomalously strong circumpolar flow that acted to “trap” most Antarctica air at high latitudes. The lingering off-equator positive SST anomalies in the central and eastern Pacific appear to have contributed toward an El Nino-like downstream flow response in the subtropics and midlatitudes of the NH even though SST anomalies have turned negative along the equator east of the Dateline in many regions.

According to the National Centers for Environmental Information (NCEI; name change from NCDC), the public impression of endless summer in parts of the eastern CONUS is supported by the August 2016 regional average temperature ranks that indicate the Northeast and Southeast experienced their warmest and fourth warmest August, respectively, in the 122-year record beginning in 1895 (http://www.ncdc.noaa.gov/temp-and-precip/us-maps/1/201608#us-maps-select). This same ink shows that CONUS minimum and maximum temperatures in August 2016 were the 6th and 16th warmest, respectively, in the last 122 years, well in accord with people’s impressions that nighttime minimum temperatures have increased relative to daytime maximum temperatures in recent years.

Positive rainfall anomalies in August 2016 were mostly confined to the central CONUS. Anomalously dry to near-normal conditions occurred in many areas of the eastern CONUS during August 2016.

For summer (JJA) 2016 overall (http://www.ncdc.noaa.gov/temp-and-precip/us-maps/3/201608#us-maps-select), the CONUS mean maximum, average, and minimum temperature was the 10th, 5th, and highest in the aforementioned 122-year record, again indicative of relatively more warming at night than during the day.

Map discussion concluded with a discussion of the recent large-scale upper-level flow evolution across the North Pacific and several subsequent downstream impacts over North America. We focused on the “Sandy-like” interaction of western North Pacific TC Lionrock with an unusually deep and intense eastern Asia trough that enabled the storm to do a “left hook" toward Japan and China (see Digital Typhoon for storm details http://agora.ex.nii.ac.jp/digital-typhoon/search_date.html.en). Lionrock’s track is somewhat unique in that the storm formed to the southeast of Japan near 32 on 19–20 August, moved southwestward to well east of Taiwan (~23 N) by 26-27 August, made a tight cyclonic turn, moved northeastward to east of Japan, and turned northwestward toward northern Japan and East Asia (http://agora.ex.nii.ac.jp/digital-typhoon/summary/wnp/s/201610.html.en). The southwestward-directed portion of TC Lionrock’s track occurred as the storm underwent a “Fujiwhara-like cyclonic rotation with TC Mindulle situated to the east (http://agora.ex.nii.ac.jp/digital-typhoon/summary/wnp/s/201609.html.en). TC Lionrock turned back to the northeast, north, and then northwest as it underwent the aforementioned trough interaction.

TC Lionrock also appears to have been associated with a fairly impressive predecessor rain event (PRE) over the Sea of Japan on 28 August as the storm underwent the aforementioned trough interaction based on the GFS forecasts (http://www.atmos.albany.edu/student/abentley/realtime/map_pacific.php). The eTRaP satellite-derived rainfall products (see below) for Lionrock (thanks to Sheldon Kusselson for providing these eTRaP product links) provide evidence that a PRE did form over the Sea of Japan. To anyone interested in doing a case study of interacting TCs and a TC-trough interaction to include determining what atmospheric processes enabled a deep meridionally oriented trough to extend to such relatively low latitudes in late August over eastern Asia, this is your event.

eTRaP Lionrock rainfall products: http://www.ssd.noaa.gov/PS/TROP/DATA/ETRAP/2016/NWPacific/LIONROCK/archive.html

eTRaP (ensemble tropical rainfall potential) product information: http://www.ssd.noaa.gov/PS/TROP/etrap-info.html

We also discussed a very good example of the discontinuous retrogression process over the central North Pacific near the Dateline that occurred between 7–9 September 2016 (http://www.atmos.albany.edu/student/abentley/realtime/map_pacific.php). Discontinuous retrogression occurs when a leading short-wave trough weakens and lifts out to the northeast at the same time as a trailing short-wave trough strengthens and deepens to the southeast. Both of these short-wave troughs help to define a time-mean longer wave trough. The leading short-wave trough weakens because it is exiting a cyclonic vorticity environment and moving toward the anticyclonic environment of a downstream ridge. The trailing short-wave trough strengthens because it is exiting an upstream anticyclonic environment and moving toward the cyclonic environment of the downstream trough. The synoptic importance of the discontinuous retrogression process is that it can help to phase lock a time-mean upper-level trough in a relatively narrow longitude band. In the present case, a persistent time-mean upper-level trough near the Dateline has favored a downstream upper-level ridge over the eastern Pacific, an upper-level trough over western North America, and another upper-level ridge over eastern North America, a necessary condition for "endless summer" over the eastern CONUS.

Surprisingly little has been written about the discontinuous retrogression process in the literature even though this process has been known to synopticians for decades. I remember Fred Sanders talking about discontinuous retrogression when I was a graduate student. Fred said that Jerry Namias, Chester Newton, and Dick Reed were familiar with the discontinuous retrogression process as well. Howie Bluestein describes the discontinuous retrogression process in the second volume of his two-volume set of synoptic-dynamic meteorology textbooks. A research opportunity would be to compare and contrast the discontinuous retrogression process with downstream baroclinic development from synoptic-dynamic, energetics, and angular momentum perspectives. Start with Hovmoller diagrams and work your way into climatological, composite, and case study analyses.

We will get to the August 2016 Louisiana floods and the 24 August 2016 Indiana-Ohio tornado outbreak next week.

A word about the North Atlantic hurricane season with the intent to stir the pot (i.e., make "trouble"). The absence of a named storm (again) at the 10 September climatological peak of the North Atlantic hurricane season is remarkable. The usual suspects (SST anomalies, shear, dry air, character of African disturbances, latitude that African disturbances exit the continent, phases of the AMO, ENSO, MJO, and assorted other teleconnection indices) are rounded up time and time again to explain the now decade-long relative absence of significant named storms over the North Atlantic. Given that varying combinations of the aforementioned suspects are invoked to explain both above and below average North Atlantic TC seasons, has the time come to revisit the science behind interdecadal TC variability across the world's ocean basins from a more holistic and big picture perspective?

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