NWS new local three-month temperature outlook

NOAA's National Weather Service releases new climate product on the web

By Andrea Bair, Marina Timofeyeva, Jenna Meyers, and Annette Hollingshead

On the third Thursday of every month, researchers, farmers, ranchers, and a multitude of others with an interest in climate turn to the national three-month temperature and precipitation outlook issued by NOAA's Climate Prediction Center for a glimpse at what conditions to expect (see pages 15 and 16). Now, thanks to a new product that went online last month, they have the option of zooming in on climate prediction information at a local level.

On July 21, NOAA's National Weather Service (NWS) introduced the Local Three-Month Temperature Outlook (L3MTO), the first in a series of online local climate products to be released by the NWS over the next two years. The L3MTO is available on all NWS Weather Forecast Office (WFO) climate webpages, offering users pie charts, tables, and text to help interpret the outlook for local climate conditions. The local climate pages can be easily accessed from a national map at

Phoenix Sky Harbor Intl Apt, AZ
Maricopa County, Coop ID: 26481

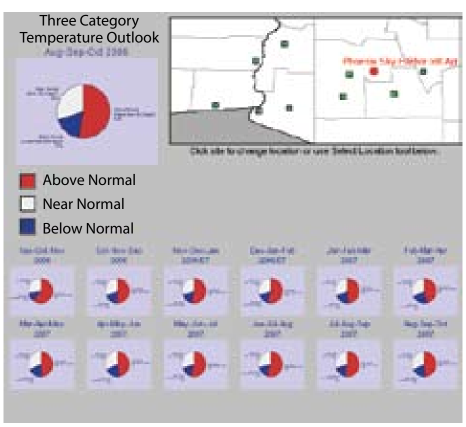

Figure 1. Map of the area near Phoenix, Arizona where the L3MTO is available. On the map, the name of the site will be displayed as the mouse moves over the site. Source: http://www.weather.gov/climate/calendar_outlook.php?wfo=psr

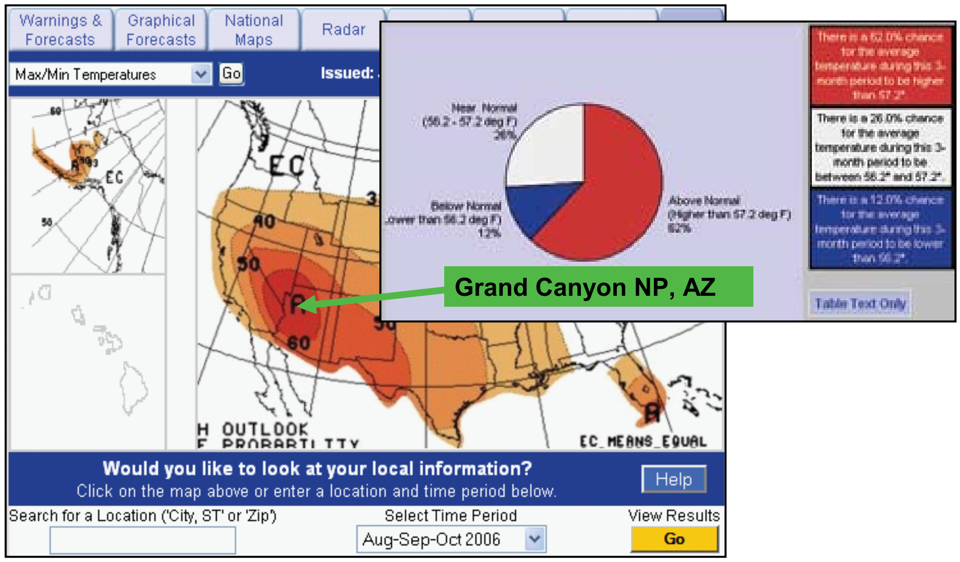

Figure 2. The CPC 3-month temperature outlook and the Grand Canyon local site where the L3MTO is available. The L3MTO provides not only the most likely category, but also the probability for the other two categories to occur, in pie chart format with supportive text for interpretation. The national 3-month temperature shows only the most likely category. Source: National Map, http://www.weather.gov/climate/l3mto.php; and Pie Chart http://www.weather.gov/ climate/calendar_outlook.php?redir=1&wfo=fgz&site=23596&lead=1

http://www.weather.gov/climate/. The NWS hopes to unveil a downscaled Local 3-Month Precipitation Outlook (L3MPO) in 2008.

The L3MTO is downscaled or translated from the three-month national temperature outlook, but contains the same type of information: the likelihood (chance) of above-average, average, and below-average temperature, and the probability of exceedance—the expected chance for a certain temperature to be exceeded during a given time. The difference is that the L3MTO extracts more spatial detail, presents the product information in several different formats, and provides interpretation information.

The L3MTO is available for about 1,160 locations nationwide, although the number of locations could increase to approximately 4,000 sites in the future, depending upon user requirements. The product's web interface includes clickable maps and text options to help navigate from one location to another. For example, Figure 1 displays all the locations around Phoenix, AZ, where the L3MTO is available. Users can move within and between states by using the arrow feature above the map.

While the national three-month outlook allows users to gain quick at-a-glance information for the entire country, it does not provide enough detail to be useful at the local level (Figure 2). The L3MTO is presented in several different formats to meet a wide range of user needs. The first product format you will encounter online is a series of pie charts. The pie chart provides the most likely category, as well as the probability for the other two categories to occur, while the national outlook only provides the most likely category.

The next product format of the L3MTO suite is the temperature range graph (Figure 3), which displays all 13 future 3-month forecast periods for an entire year. The climatological median is plotted between five different user-selected confidence intervals (or levels of

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L3MTO, continued

expected chance), which include 99, 95, 90, 75, and 50 percent. Supportive text is available by clicking in the confidence interval for any one of the three-month periods, to help with interpretation. The median value means that during the present climatological reference period (1971–2000), 50 percent of the year's temperature was greater than and 50 percent was less than the median.

The Probability of Exceedance component appears as a chart or a table, with the chart also displaying the observed three-month temperature for the previous five years, for comparison (Figure 4).

As with all long term outlooks and forecasts, limitations exist with the L3MTO. For example, the L3MTO cannot provide a high confidence outlook for an exact three-month temperature value or a departure from that value; the product is in probabilistic format. To help the user assess the skill of the L3MTO, every product component includes a link to a verification tool that was developed by CLIMAS and expanded to include local climate outlook hindcast information and requirements. The outlook hindcast information is available from December 1994 to 2003. A hindcast is a method of assessing forecast or model prediction accuracy in which forecasts or model results are compared with a known period in the past. The requirements include a selection of forecast target seasons and specific years for computation of verification statistics. New users are encouraged to visit the "Questions and Feedback" tab to offer suggestions on the L3MTO.

The next local outlook product, scheduled for release in the summer of 2007, is the Three-Month Outlook of Local El Niño/La Niña Impacts on temperature and precipitation. Eventually, additional meteorological parameters will be added.

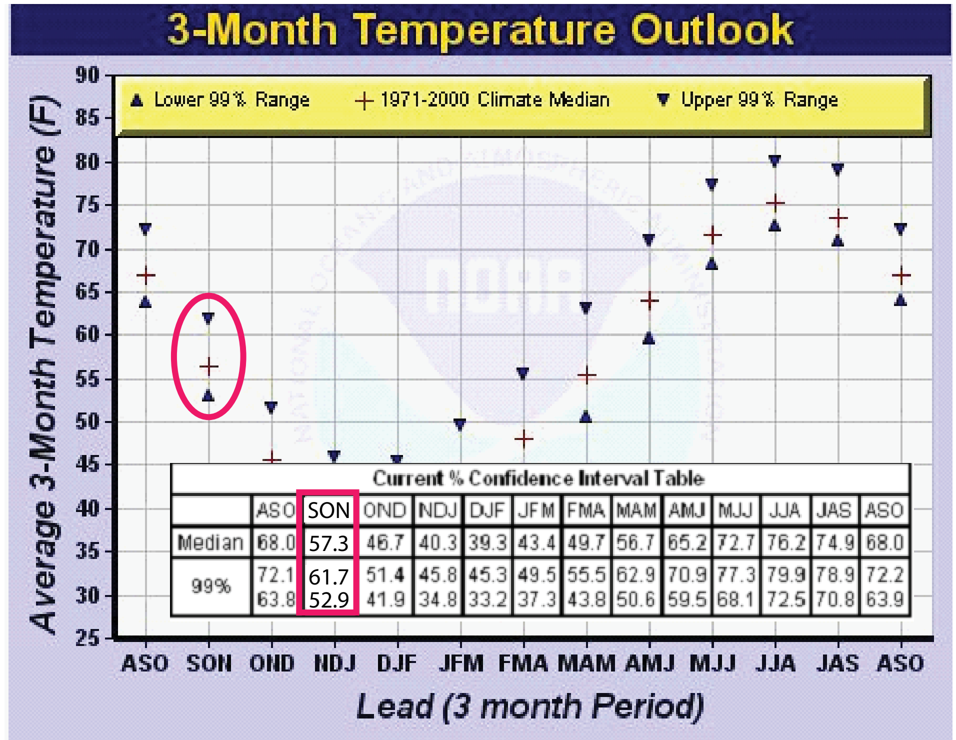

Figure 3. The average temperature outlook for Albuquerque, New Mexico (issued July 2006), suggests that during September–November 2006 there is a 99 percent chance that the average 3-month temperature will be within the range of 52.9 and 61.7 degrees F. There is a greater chance (71 percent) that the temperature will be higher than the climatological median of 56.5 degrees F, and a lesser chance (29 percent) that the temperature will be lower. Source: http://www.weather.gov/climate/temp_range.php?redir=1&wfo=abq&site=290234&lead=1

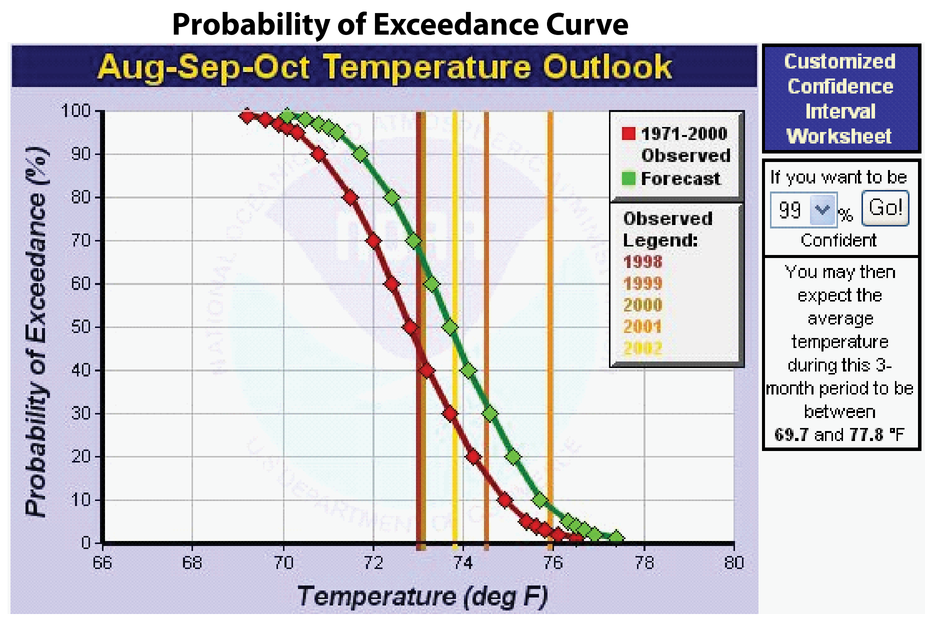

Figure 4. Probability of exceedance curve for Kingman, Arizona during June–August 2006. The Probability of non-exceedance and the probability of exceedance with the axis switched can also be displayed. Source: http://www.weather.gov/climate/calendar_probability.php?wfo=vef&site=24645

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East Pacific hurricanes bring rain to Southwest

By Melanie Lenart

Pacific hurricanes and tropical cyclones can have a profound influence even on the landlocked Southwest—and, arguably, their impact may increase as the oceans warm.

"It turns out that there's quite a lot of tropical cyclone activity that actually impacts the Southwest," explained Elizabeth Ritchie, a climatologist who joined The University of Arizona faculty this summer. September is the peak month for this activity, which has resulted in some serious floods in years past.

An average of 2.2 remnants from East Pacific hurricanes and named tropical cyclones ventured into the Southwest each year between 1992 and 2004, representing 15 percent of the region's named storms, Ritchie found in an analysis she conducted with a colleague. A tropical cyclone must reach sustained wind speeds of 39 miles per hour (mph) to qualify for a name, and 74 mph to attain hurricane status.

All but two of the 29 cyclones brought at least some rain to the Southwest. The researchers defined the Southwest as Arizona, California, and New Mexico.

"The main story is Albuquerque really does the best out of all these sites," Ritchie noted, adding, "Tucson is not far behind."

During this 13-year time frame, Albuquerque received a total of 20 inches of rainfall from tropical cyclone remnants, while Tucson received 12 inches and Phoenix collected 4 inches. Compared to the annual average rainfalls for these three cities, the values amount to half a year's worth for Phoenix, a year's worth for Tucson, and more than two years' worth for Albuquerque.

About 1.3 tropical cyclone remnants affected the Southwest each year during the time frame 1966–1984, according to an earlier analysis by Walter Smith of the National Oceanic and Atmospheric Administration (NOAA) that was published in 1986 as a NOAA Technical Memorandum.

However, it's unlikely the studies by Ritchie and Walter are directly comparable. Detecting remnants of tropical cyclones remains more of an art than a science, researchers noted, as official long-term tracking data ends when wind speeds fall below tropical storm status.

From 1974 through 2004, the number of intense East Pacific hurricanes increased by about a third, according to a study by Peter Webster of the Georgia Institute of Technology and several colleagues. Intense hurricanes have sustained winds above 130 mph. Webster and his colleagues compared data based on satellite imagery and found 49 intense hurricanes forming from 1990 through 2004 compared to 36 forming from 1974 through 1989.

Their finding and its perceived link to global warming via rising sea surface temperatures remains controversial among some researchers (see June 2006 *Southwest Climate Outlook*). Although climate experts agree rising ocean temperatures strengthen individual hurricanes, they disagree on whether past data is reliable enough to reveal a trend directly connected to global warming.

More intense East Pacific hurricanes won't directly translate into more rainfall in the Southwest, at any rate, as David Gutzler, a climatologist at the University of New Mexico, pointed out. That's because storms are more likely to become intense when contacting the warm waters of the open sea, he noted, while those heading into the Southwest must swing toward cooler coastal waters. The current from Alaska typically keeps U.S. coastal sea surface temperatures in the 70s and below even in August.

Figure 5. Satellite image of hurricane Javier on September 13, 2004 approximately 610 miles southeast of Cabo San Lucas, Mexico. Source: Jesse Allen, NASA Earth Observatory, data from the MODIS Rapid Response team

Tropical storms generally must encounter sea surface temperatures (SSTs) of 83 degrees Fahrenheit or more to attain the sustained 111 mph wind speeds of major hurricanes, based on a study of 270 Atlantic hurricanes and corresponding SSTs by Patrick Michaels and colleagues from the University of Virginia (*Geophysical Research Letters*, May 2006).

The tropical storms that do reach the Southwest can provide drought relief or cause floods, sometimes both. The remnants of Hurricane Javier (Figure 5) helped break a string of dry years in September 2004, ushering in a wet winter by gently soaking parts of drought-parched Arizona and New Mexico.

Too much of a good thing led to flooding in the autumn of 1983, when four cyclone remnants visited the Southwest. The storm from former Hurricane Octave created the most havoc, causing $500 million in flooding damage to Arizona with its days-long rains.

Melanie Lenart is a postdoctoral research associate with the Climate Assessment for the Southwest (CLIMAS). The SWCO feature article archive can be accessed at the following link: http://www.ispe.arizona.edu/climas/forecasts/swarticles.html