

Alex Mitchell and Tyler Leicht
9 April - Bandar Abbas, Iran and Karachi, Pakistan

Big Picture

With the polar jet displaced so far to the north, the main driver of variability will be due to the subtropical jet. Progressive troughs from the Atlantic are able to traverse underneath a large-scale block over northern Europe, aided by how anomalously fast the subtropical jet is over northern Africa. These systems will produce stormy weather across the Mediterranean basin before entering the forecast domain. These storms will mostly track northeast into the Black Sea because of the diffluent pattern in the jet stream over eastern Turkey, Iraq, and Iran. By day 2 and 3, convection over equatorial Africa will help to induce negative PV advection along the subtropical jet, resulting in anticyclonic curvature in the jet itself. This curvature on days 3 and 4 sets up a much stronger meridional component to the subtropical jet, allowing for some of these shortwave features traversing the Mediterranean to travel further south. This southeastward track of some of these features will act to create a -3 to -4 sigma trough around the eastern coast of the Arabian Peninsula and the southern coast of Iran near Bandar Abbas. While no classic surface cyclone will develop in association with this trough, precipitation is expected across Oman, eastern Iran, Afghanistan, and the foothills of the Himalayas over several days. Depending on localized terrain variations, favorable regions for upslope precipitation could see up to 10 cm of rain, suggesting the possibility of flooding across much of this region because of persistence and anomalously high precipitable water values. By the end of the forecast period, the trough over the Arabian Sea will begin to dissipate and discontinuous trough retrogression will occur as a shortwave traversing the Mediterranean phases with a broader trough focused over western Europe. This will shift the area of precipitation to eastern Turkey, the Caucasus region, and northern Iran. In addition, the southern branch of the subtropical jet will dissipate slowly as the climatological shift of the jet north of the Tibetan Plateau begins by days 8 through 10.

Day 7-10

The last forecast period sees a shift in the overall flow pattern from the first two periods, as the trough over the Arabian Sea diminishes and a separate trough over Turkey and the eastern Mediterranean intensifies. This is in part due to a large cyclonic/anticyclonic dual wave breaking event occurring upstream in the central Atlantic back on day 4, perturbing the flow significantly. This wave breaking also acts to create a broad ridge over the central Mediterranean, helping to anchor the new trough to the east. While much less anomalous than previously over Iran, the moisture transport associated with the northward-directed branch of the subtropical jet will allow for broad regions of topographically-induced precipitation. Further east, southerly flow over the Arabian Sea begins to slowly weaken with the changing flow pattern, eliminating the moisture source for the precipitation from days 4-6.

Day 4-6

The anticyclonically curved jet over North Africa shifts further east and a downstream shortwave trough begins forming over Saudi Arabia as a result of cold air advection aloft, favoring large scale ascent ahead of the feature, enhanced mid-level moisture advection from the Arabian Sea and heavy, orographically induced precipitation along the southern borders of Iran and Pakistan. A surface cyclone centered over eastern Iran forms ahead of the shortwave as well, providing low-level lifting ahead of the system as it moves northeast into northern Pakistan and around the northern boundary of the Himalayas. The phase speed of the upper level trough in conjunction with anomalous precipitable water aided by a pressure system centered over the northern Arabian sea will bring about uncertainty in regards to the amount of precipitation most of Iran and southern Pakistan will experience.

Day 0-3

The North Africa subtropical jet will extend along 25N at the beginning of the period, with prevailing westerly flow throughout much of the troposphere for the Middle East. Advection of moisture originating from both the Red Sea and Persian Gulf in combination with cyclonic vorticity advection ahead of a small scale shortwave depicted at the 500-hPa level will favor precipitation along the windward side of the terrain in western Pakistan. By day 2, the development of upstream precipitation over Central Africa will induce diabatic heating, acting to change the large-scale transverse thermally indirect secondary circulation associated with the subtropical jet centered over North Africa. The jet becomes more anticyclonically curved aloft in response to upstream latent heating and coherently builds a ridge on the windward side in response to the upstream heating. With anomalously warm SSTs in the Arabian Sea and a shortwave trough beginning to build upstream of Iran by the end of the period due to upstream changes of the North Africa jet structure, low-level baroclinicity and ample tropospheric moisture advection will set the stage for heavy precipitation throughout the surrounding region.

Probabilistic Forecasts for the period

Bandar Abbas, Iran

Day 0-3

High Temperature 10th: 85°F 50th: 87°F 90th: 88°F

Low Temperature 10th: 75°F 50th: 76°F 90th: 77°F
Precipitation 10th: 0.00" 50th: 0.00" 90th: 0.02"

Day 4-6

High Temperature 10th: 75°F 50th: 80°F 90th: 83°F
Low Temperature 10th: 71°F 50th: 72°F 90th: 73°F
Precipitation 10th: 0.25" 50th: 0.75" 90th: 1.50"

Day 7-10

High Temperature 10th: 85°F 50th: 88°F 90th: 91°F
Low Temperature 10th: 74°F 50th: 77°F 90th: 79°F
Precipitation 10th: 0.00" 50th: 0.02" 90th: 0.05"

Karachi, Pakistan

Day 0-3

High Temperature 10th: 82°F 50th: 84°F 90th: 86°F
Low Temperature 10th: 73°F 50th: 75°F 90th: 77°F
Precipitation 10th: 0.00" 50th: 0.05" 90th: 0.30"

Day 4-6

High Temperature 10th: 78°F 50th: 81°F 90th: 83°F
Low Temperature 10th: 71°F 50th: 73°F 90th: 75°F
Precipitation 10th: 1.00" 50th: 2.00" 90th: 3.00"

Day 7-10

High Temperature 10th: 84°F 50th: 86°F 90th: 88°F
Low Temperature 10th: 75°F 50th: 79°F 90th: 83°F
Precipitation 10th: 0.00" 50th: 0.00" 90th: 0.00"