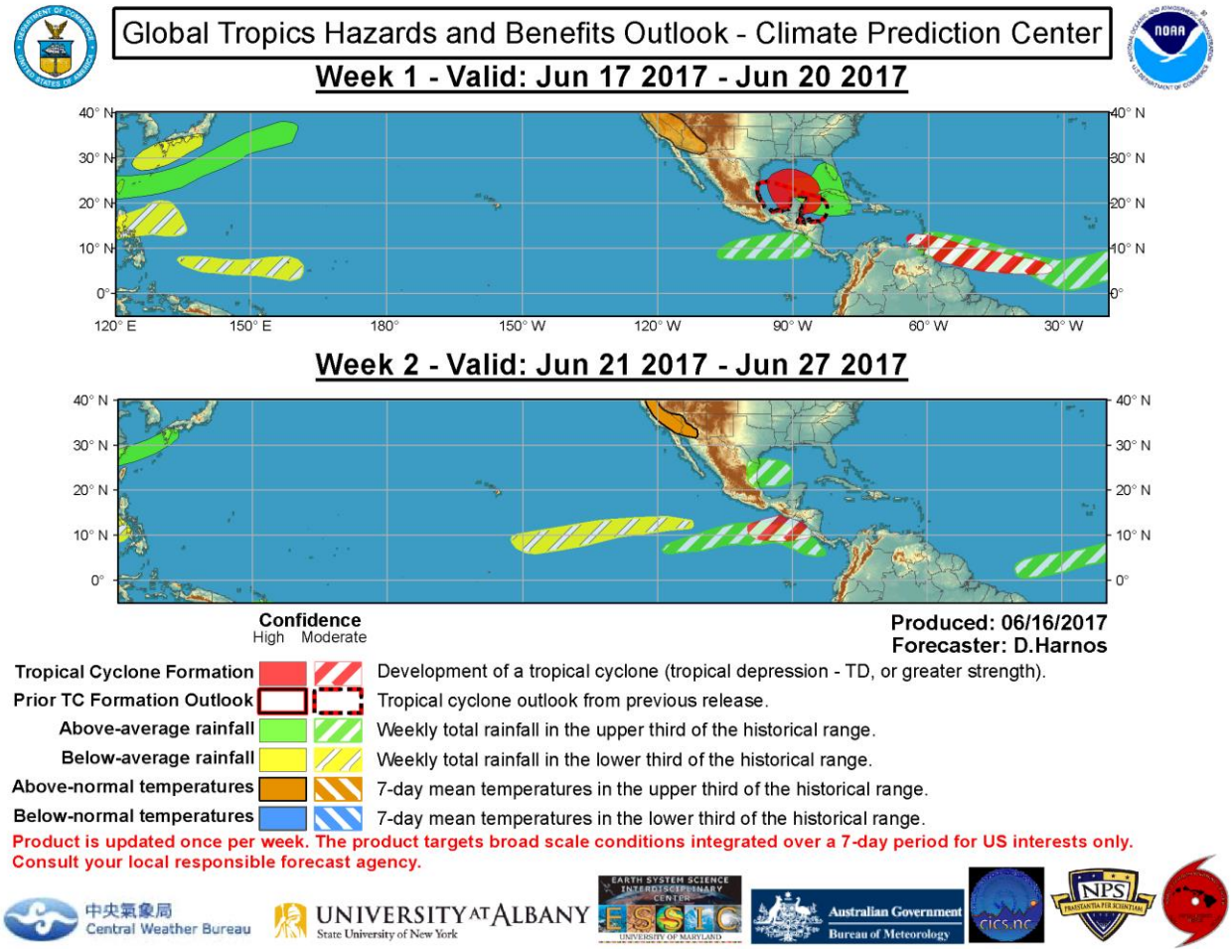

Attention continues to be focused on early season tropical cyclone (TC) potential in the Atlantic basin. The circulation center lifting northwestward from South America continues to look on track for TC development near the Yucatan, with the area targeted for genesis shifted slightly north relative to the initial outlook. If the system does develop, substantial uncertainty exists regarding its track due to variability among forecast intensity and positioning of ridging off the U.S. eastern seaboard. ECMWF ensembles are the most amplified with this ridging, which would support a towards Mexico or South Texas. The GEFS is slightly weaker with the ridge, with some members having a similar track to the ECMWF while others track towards the central Gulf or Mexico. Canadian ensembles are weaker with the ridge and develop the system closer to Cuba, before generally having a track towards the central Gulf states. Intensity of the system, if it were to develop, is also highly uncertain, as a more northern track brings the system towards a gyre of anomalously cold sea surface temperatures (SSTs) in the northern Gulf of Mexico in addition to higher forecast wind shear, while the more western track could see increased interactions with land that hinder development and growth. Nevertheless, confidence of cyclogenesis is upgraded to high with this system in the updated outlook, while the National Hurricane Center (NHC) update from 2 PM on 16 June gives the system a 60% chance of forming over the next 5 days. The more westward track indicated by the ECMWF just north of the Bay of Campeche is favored at this time. Elsewhere, in the Central Atlantic, near 6N/34W, an easterly wave has seen its development

odds increase over the past several days. A continued progressive, westward track to this system is forecast over the next several days with near- to below-normal wind shear forecast through the Lesser Antilles while observed SSTs are anomalously warm. Given the favorable environment, development odds for this system are increased to moderate in the updated forecast. As of 2 PM on 16 June NHC gives this system a 50% chance of formation in the next 5 days. Tropical cyclogenesis in the East Pacific is possible with moderate confidence during Week-2 to the south of Guatemala in association with forecast above-normal SSTs, anomalously low wind shear, and general troughing among ensemble guidance. The suppressed phase of a Rossby wave is expected to continue unfavorable TC odds in the West Pacific.

Precipitation-related forecast probabilities are updated to reflect the latest forecasts of TC activity in the Atlantic. Even if the system in the Gulf of Mexico does not develop, a northward surge of tropical moisture to the east of the system is favored with high confidence of above-normal rains for the Western Caribbean, much of Florida, and eastern Gulf of Mexico. Rainfall odds are also increased to moderate confidence along the track of the system in the Central Atlantic given the favorable environment for subsequent development. Minor changes were made elsewhere in both forecast periods to account for the most recent ensemble guidance, with the most noteworthy change being a slightly slower northward progression now favored for the Meiyu front in the West Pacific. Above-normal temperature forecasts in the southwestern U.S. continue with high confidence and minimal changes to the forecast area aside from some slight eastward expansion, with the prolonged heat event forecast to begin subsiding in the second half of Week-2.

---------- Original discussion from 13 June continues below. ----------

Substantial uncertainty exists regarding the evolution of ongoing convective modes in the global tropics. The RMM index suggests an emerging Madden-Julian Oscillation (MJO) in Phase 1 over Africa after exhibiting reduced amplitude over the previous week. The CPC velocity-potential based MJO index tracks an eastward propagating enhanced convective signal that is presently over the Atlantic. Given a periodicity of around 2 weeks this signal is seemingly Kelvin-wave driven, however, as it is at least double the characteristic phase speed of the MJO. Objective filtering of outgoing longwave radiation and velocity potential fields confirms presence of a Kelvin wave presently near the Prime Meridian, with another Kelvin wave analyzed just east of the Date Line. The aforementioned analyses also show a more slowly eastward propagating convective envelope shifting east from Africa to the Indian Ocean during May, and would currently be centered over the eastern Maritime Continent. The slow moving enhanced convective signal has been damped, however, by mid-latitude ridging that has been inducing mass building aloft between the eastern Maritime Continent and Date Line in recent weeks, with this scenario helping to damp convection here, which could be masking the slowly-moving enhanced mode noted earlier. Dynamical model guidance is mixed on the treatment of these modes over the next two weeks,

with the GEFS and several other systems maintaining an intraseasonal signal in Phase 1 or pushing it eastward into the Indian Ocean. The ECMWF solution is favored in this outlook and suggests weakness of the MJO throughout the outlook period, due to the pair of observed Kelvin waves being forecast to continue and remain nearly 180 degrees apart, effectively destructively interfering with the RMM index.

During the past week a pair of tropical cyclones (TCs) developed. First, Tropical Storm Calvin developed in the East Pacific just south of the Gulf of Tehuantepec on 11 June, making landfall in Oaxaca on the 13th with 40 mph winds and accompanying heavy rains and mudslides. In the West Pacific, Tropical Storm Merbok formed over the South China Sea on 11 June and made landfall just east of Hong Kong the following day with 45 mph winds, flooding rains, and landslides. Currently the National Hurricane Center is monitoring a potential TC formation just east of the Yucatan and forecasting a 20% chance of a system forming in the next 5 days for this region in association with a monsoon gyre forecast to drift northwestward from South America. Ensemble guidance has been supporting development of this system over the last week of runs, but a consistent southern shift in the forecast track has been bringing the system closer to Central America which could help inhibit development. Moderate confidence is given on either side of the Yucatan for TC formation in Week-1 in association with this system, with a chance of development possibly sliding into early Week-2. A robust early season easterly wave is also currently present in the tropical Atlantic near 5N/15W, but development appears unlikely before the wave reaches high wind shear to the east of the Lesser Antilles. Tropical cyclogenesis is also possible during Week-1 and Week-2 with low confidence in a similar region to where Calvin formed in the East Pacific, and also in the West Pacific stretching approximately between the Philippines and Guam. Each of these regions are supported by statistical guidance, but dynamical guidance is less bullish.

The Week-1 outlook is influenced heavily by assumed evolution of ongoing modes of tropical variability and ensemble guidance, which are reasonably consistent during this timeframe. Highest confidence in Week-1 is for above-normal precipitation from Southeast China and across Taiwan into the North Pacific associated with the Meiyu front, anomalous dryness to the north of this feature, and anomalously dry conditions across the northern Indian Ocean in association with a quasi-low frequency suppressed mode that has drifted slowly eastward over the last month. Moderate confidence of above-normal precipitation exists in the East Pacific and near the Yucatan associated with anticpated Kelvin wave passage and the aforementioned monsoon gyre that shows signs of tropical development. Enhanced phases of both a Kelvin and equatorial Rossby wave are responsible for favored above-normal precipitation in the tropical Atlantic and equatorial Africa. Below-normal precipitation is favored with moderate confidence in the vicinity of the South China Sea in associated with the suppressed phase of an equatorial Rossby Wave. Remaining precipitation outlooks during Week-1 result from agreement among the CFS, GEFS, and ECMWF guidance. Above-normal temperatures are forecast with high confidence for the Southwest U.S. throughout both weeks in association with anomalous ridging in the North Pacific that could yield all time record high temperatures in some areas.

Model solutions diverge substantially during Week-2, with the ECMWF having a wetter solution across the Indian Ocean while the CFS is very dry. The CFS instead has anomalous convection near the Date Line and in the East Pacific, while the ECMWF is dry there. These differences are apparently tied to the CFS initiating low frequency convection over the Indian Ocean during Week-2 and Central Pacific convection associated with an equatorial Rossby wave. ECMWF guidance appears more representative of Kelvin wave activity in the Indian Ocean and Maritime Continent, while it lacks the Rossby wave in the Central Pacific depicted by the CFS. Given the CFS tending to overplay westward moving features, ECMWF guidance was slightly favored in Week-2, but overall confidence is low. High confidence in above-normal precipitation continues in Week-2 with the Meiyu front lifting north towards Japan. Moderate confidence of anomalous drying in the South China Sea is forecast to continue in Week-2 associated with the suppressed phase of a currently observed equatorial Rossby wave. Anomalous dryness forecast in the Arabian Sea appears tied to a building low frequency state for this region. Remaining Week-2 precipitation forecast areas are sparse due to the lack of consensus in the forecast guidance.

Forecasts over Africa are made in consultation with the CPC international desk, and can represent local-scale conditions in addition to global-scale variability.