



HOT SPOTS

SUDAN

Sudan's climate transitions from hot, wet, and humid in the southern third of the country to hot and arid in the deserts of the northern third. The southern third has a brief dry season in winter and early spring (Northern Hemisphere seasons). This is when the highest temperatures occur here. The central third has a rainy season in summer and early fall, but is dry the rest of the year. The northern third is dry year-round, is extremely hot in summer, and is mild in winter. The Red Sea coastal lowland is different from the rest of Sudan. It gets its rainy season in November and December due to onshore flow under the northerly flow of winter. A full-year Sudan climate overview is located at https://www.afccc.af.mil/narratives_mil/products/sudan.txt.

Sudan contains most of the upper basin of the Nile and its tributaries (Figure 1). The largest of the tributaries are the Blue and White Nile. The basin extends from north to south across nearly the whole of eastern Sudan. It is mostly below 1,600 feet elevation. Highlands rim the basin. Elevations average 1,000-3,000 feet, but several peaks rise to 5,000-10,000 feet. The Jabal Murrah, in west central Sudan, is the largest range.

The climate is monsoonal. In winter, dry, northerly winds dominate all but the southernmost border region (Figure 2a). In summer, moist, southerly winds dominate. The monsoon trough, the boundary between the two regimes, lies across north central Sudan in summer (Figure 2b). Rainshowers and thunderstorms accompany the monsoon trough as it moves north and south. Secondary climatic mechanisms include Mediterranean lows and their fronts, terrain effects, and strong surface heating, which produces convective turbulence, thunderstorms, and dust storms.

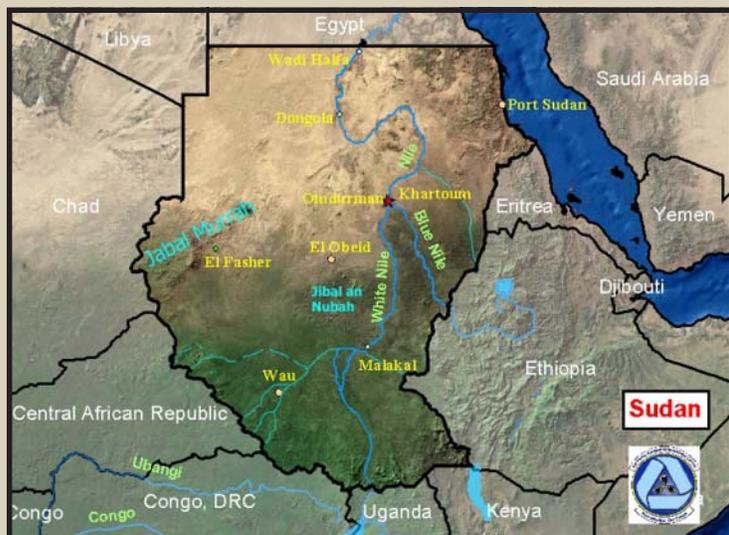


Figure 3. Sudan Terrain Map. Darfur is the westernmost province in Sudan. El Fasher is in south central Darfur.

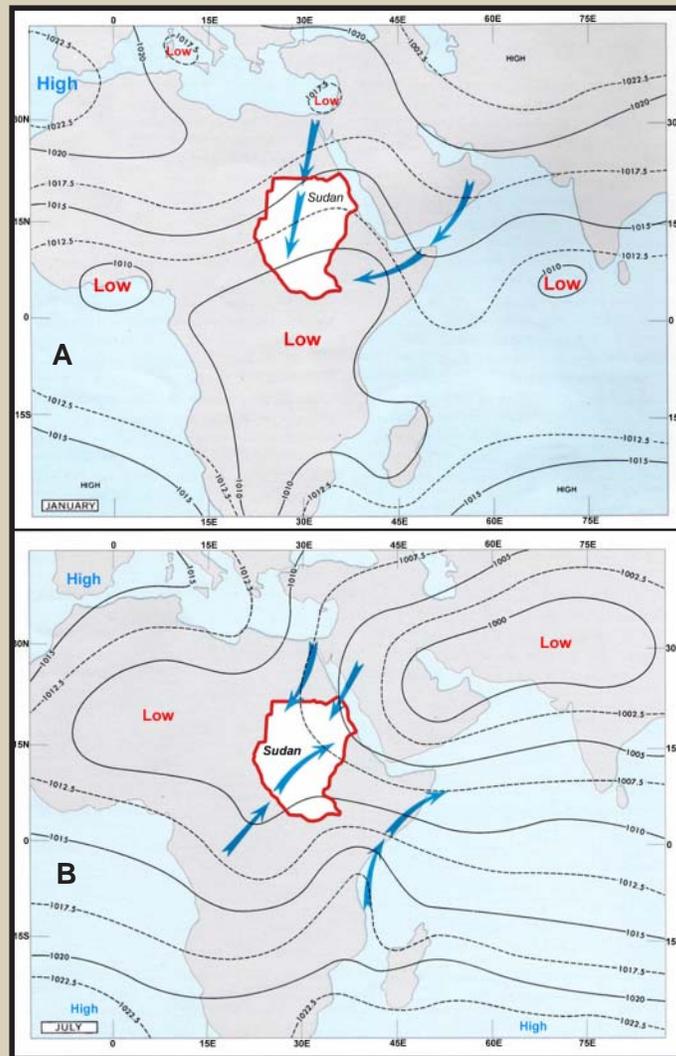


Figure 2. Wind Flow and Pressure Patterns

In general, cloud cover increases from north to south and the greatest amounts typically occur in July and August. The Red Sea coast has a double maximum. The primary one occurs in winter, and the secondary one occurs in summer.

The Jabal Murrah is cooler and gets more rain than the surrounding lowlands and even light snowfall is possible on the highest peaks in winter. The mountains in the southeastern border region get the most rainfall in Sudan. Above 3,000 feet in the hills and mountains that parallel the Red Sea Coast, temperatures are cooler and skies are cloudier than in the interior lowlands.

Contact Mrs Higdon at DSN 673-9001/COM 828-271-4218 or email at melody.higdon@afccc.af.mil.

Unified Engagement 04 (UE 04) Support. The AFCCC Modeling and Simulation Office (SM) recently provided data and support to UE 04, the Air Force Chief of Staff's premier Title 10 wargame. The objective of UE 04 was to explore Air Force, Joint, and Coalition CONOPS against a 2015 regional threat using currently programmed force structures.

SM provided three months of data for the following elements over the Area of Operations: surface visibility, cloud cover, ceiling, surface temperature, surface wind speed and direction, precipitation, ionospheric scintillation, and UHF disturbances. Modelers from the Strategy, Concepts and Doctrine Division (HQ USAF/XOXS) built an ingenious tool for viewing the data and made it available to wargame participants (see figure 3).

The volume of data and number of weather elements provided players and evaluators with tremendously more weather intelligence than they had in previous versions of this wargame, and weather effects (or lack thereof) on operations were considered throughout Blue and Red planning and Assessment adjudication.

In addition to supplying data, the SM Division Chief, Major (s) Kenneth Cloys, participated in the exercise and provided on-site subject matter expertise to the assessment teams. He interacted with experts in other functional areas like C4ISR, Air Ops, Maritime Ops, and SOF. As a result, he helped ensure the evaluators considered weather and its impacts to operations. This allowed the evaluators to more accurately and realistically rate Red and Blue team activities.

Having an AF Weather participant in UE 04 enhanced the game's objectives and realism, plus it established a precedent for a weather presence in the operational training environment. We hope our participation opens the door for an even more robust role in the next event.

Contact Major (s) Ken Cloys at DSN 673-9016/COM (828) 271-4209 or email at kenneth.cloys@afccc.af.mil

Theater Climatic Information Service Build 1.1. In June, the AFCCC Operational Climatology branch released the Theater Climatic Information Service (TCIS) Build 1.1 to the Central Command (CENTCOM) AOR. Based on the idea of spatially oriented data, the TCIS provides a quick, efficient way for mission planners to interrogate climatological data. The package includes all data related to the 27 countries in CENTCOM's AOR along with ACMEs images, Theater Climatic Briefs, Climatological Atlases, and AEF Briefings. TCIS Build 1.1 represents a massive step up for the TCIS concept, integrating Geographic Information Systems (GIS) layers, coordinate conversion tools between Latitude/Longitude, UTM and MGRS, and much more. A marker placement tool is also included. This tool allows the user to select a point of interest (by either clicking on a map or typing in the coordinates) and measure the distance from that point to any other part of the map by moving the mouse.

The TCIS is a big building block for the Strategic Climatic Information Service (SCIS), a replacement for the aging AFCCC web page. In September, Build 1.2 will be released to CENTCOM as well as EUCOM, SOUTHCOM, and NORTHCOM users. This will allow a seamless transition from one geographic Unified Command's AOR to another, and nearly complete the SCIS concept.

For more information, download an informative slide show at https://notus.afccc.af.mil/website/SCIS_Information_Brief.ppt or contact TSgt Wretlind or Mr. Kiess at DSN 673-9018/COM 828-271-4582, or email at benjamin.wretlind@afccc.af.mil or raymond.kiess@afccc.af.mil.

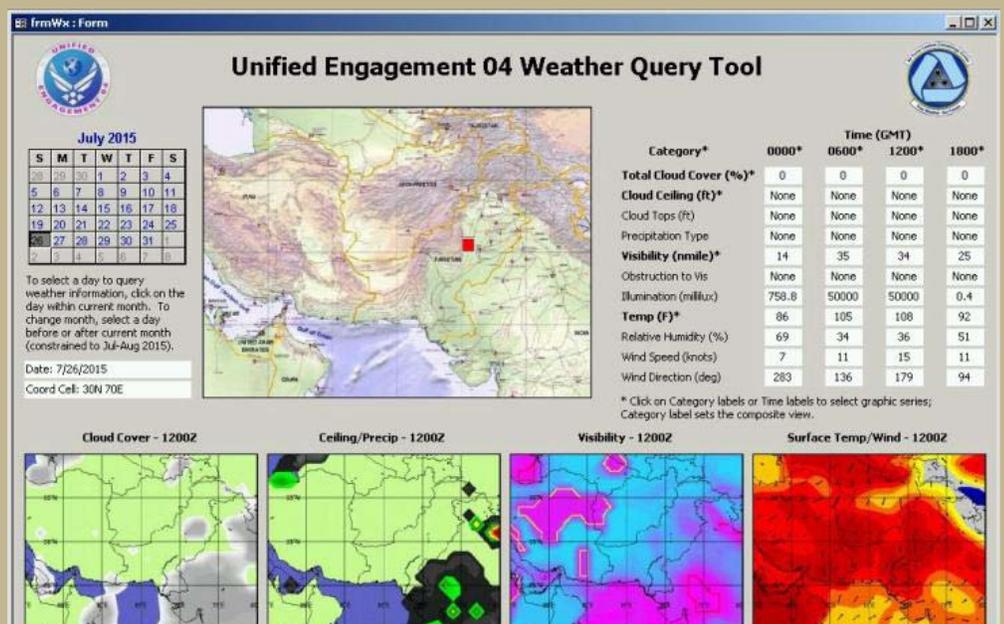


Figure 3. Screen Capture of Online Query Tool.

Ops Impacts

Eglin AFB McKinley Climatic Laboratory RH Support.

To justify a new environmental chamber, the 28 Test Squadron asked the AFCCC Tailored Climatology Section (DOPT) to provide a worldwide summary of maximum and minimum relative humidity values. DOPT tailored the request for values at temperatures of 20F, 40F, 60F, 80F, 100F, and 120F. In the near term, this data is being used to justify a proposal to upgrade their ability to test and evaluate chemical, biological, radiological, and nuclear (CBRN) equipment capabilities of ACC and DoD. In the long term, this data supports the technical advancement of the McKinley Climatic Laboratory facilities at Eglin AFB.

Pentagon Flooding Construction Support.

When several sections of the Pentagon flooded during a renovation project, the Pentagon Renovation Office (PENREN) turned to AFCCC for rainfall information. The AFCCC Tailored Climatology Branch (DOPT) determined PENREN needed rainfall rates. They quickly analyzed various rain events over the past six months at Reagan International. The information DOPT provided potentially helped save millions of dollars by preventing future flooding in renovated sections of the Pentagon.

Uzbekistan Airfield Reliability Study (ARS).

AFCCC recently created a tailored ARS for the 416 AEG in Karshi-Khanabad, Uzbekistan in support of 1,000 Operation ENDURING FREEDOM C-130 airlift missions that transit Afghanistan monthly. According to the customer, this summary simplified tough decisions relating to flight operations for aircraft assets valued at over \$400M. Planners are able to reduce the number of cancelled flights and inadvertent diversions associated with airfield closures during adverse weather conditions.

Arrow Weapons Systems.

AFCCC provided the Missile Defense Agency (MDA) with summarized upper-air data to support the \$1.3B joint U.S. and Israeli Arrow Missile Defense System. The data allowed MDA and related agencies to perform post-test analysis for the first "real world" test performed outside of Israel. The test was particularly important because flight restrictions in Israel prevented testing under real-world conditions. U.S. and Israeli researchers are developing a regional ballistic missile system to supplement the shorter-ranged Patriot Missile Defense System.

For Operational Support Contact:

e-mail: doo@afccc.af.mil

Comm Phone: (828) 271-4291

DSN Phone: (312) 673-9004

niprnet: <https://www.afccc.af.mil>

siprnet: <http://afccc.asheville.af.smil.mil>



Are you doing weather-related research? The Air Force Weather Technical Library (AFWTL) can save you time with an extensive bibliography search. For example, when AFWA/DNTR needed information on low-level icing, the staff produced a bibliography containing 250 citations to books, reports, theses, and journal articles.

Name your subject, specify the extent of the search, and library personnel will take it from there. Items within the AFWTL collection can be borrowed by request over the AFWTL webpage. Items outside of the collection are still available, but will take more time for the library to obtain. Contact Mr. Swanson at DSN 673-9019 / COM (828) 271-4270 or email Gary.Swanson@afccc.af.mil.



Can't find the product or data you're looking for on our web site?

Give our new "Customer Request Form" a try at <http://navy.ncdc.noaa.gov/services/request4.html>. The Customer

Request Form, which is located on our Products page, allows you to give a detailed description of the product or information you are looking for and allows us to better answer your climatology questions. It also provides us with information about the type of support we are providing, who we are supporting, the critical nature of that support, and the impact if this support was not available. Our "Products Description Page" located at <http://navy.ncdc.noaa.gov/products/productdesc.html> has also been updated to provide more information about each of our products and applications, as well as links to other climatology web sites for things like satellite and NEXRAD data. You can also get to this information on our Products page by clicking the link "more info". We now have additional Navy model archives available on our website; Optimum Thermal Interpolation System (OTIS), which provides temperature parameters and salinity for 34 levels from the surface to a depth of 5,000 meters, and Thermodynamic Ocean Prediction System (TOPS) which provides temperature and currents for the ocean surface, as well as mixed layer depth. Check these out under the *Fleet Historical Fields* application at <http://navy.ncdc.noaa.gov/gradsmap/indexcustomfhf.html>. Remember, if you have to deploy, know what to expect before you get there! Make us your first stop for all your marine climatology needs.

For Operational Support Contact:

Email: Navy.fnmod@noaa.gov

Comm Phone: (828) 252-7865

internet: <http://navy.ncdc.noaa.gov/>

siprnet: <http://navyclimatology.navy.smil.mil>

The AFCCC Strategic Weather Now newsletter is an official, non-directive publication. Its purpose is to transmit technical information pertaining to products and services available from AFCCC. The views and opinions expressed herein are those of the individual author. They do not purport to express the opinion of the Air Force Weather Agency, the Director of Weather, HQ USAF, the Department of the Air Force, or any other department or agency of the United States Government.