WEATHER CLIMATE WATER

WORLD METEOROLOGICAL ORGANIZATION

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Defining the Essential Climate Variables for Observations

The first conference dedicated to climate observation – Global Climate Observation: the Road to the Future – took place in Amsterdam, Netherlands, from 2 to 4 March 2016. The event provided an opportunity for representatives from 40 countries, over 150 producers and users of climate observations as well as other stakeholders, to discuss the current monitoring of Essential Climate Variables (ECVs) and identify new variables that should be monitored in order to fill gaps in climate observation.

Discussions on the relevance of the current ECVs in improving our understanding of the global cycles of water, energy and carbon led conference participants to agree that more information on these was needed in order to fully understand the Earth's climate. Further discussions highlighted that though many of the current ECVs address ecological and biological aspects of the climate, the so-called "slow variables" describing biological processes are currently parameterized rather than monitored. The conference also explored how the use of better indicators than global surface temperature average, such as sea level rise, ice extent and ocean acidification, could improve communication on the rate and extent of climate change.

Climate observations, allowing monitoring of ECVs, are critical to our understanding of the climate. Since 1992, Global Climate Observation System (GCOS) has been responsible to the United Framework Convention on Climate Change (UNFCCC) for ensuring a sustained, long-term and reliable system for monitoring the global climate. The outputs of the conference will shape the new GCOS Implementation Plan, which will be submitted to the 22nd session of the Conference of the Parties (COP22) of the UNFCCC in November.

ECVs support not only the work of the UNFCCC, but also that of the Intergovernmental Panel on Climate Change (IPCC) and many other international organizations and programmes. The IPCC Fifth Assessment Report notes that there are gaps in the current Global Climate Observing System on which the assessments it makes are based. More detailed climate observations are also needed for adaptation planning to reduce risks from climate change and variability. It is, therefore, crucial to make further progress towards achieving a fully implemented, sustainable Global Climate Observing System.

For further information, including conference videos and slides, please visit gcos-science.org

Essential Ocean Variables

In an earlier meeting in February, a Panel of the Global Ocean Observing System (GOOS), part of the GCOS network, identified nine new biological Essential Ocean Variables (EOVs). The GOOS Biology and Ecosystems Panel is currently working on specification sheets for these variables including links to observing networks, and will review these with the ocean observing community before they are finalized. Other GOOS panels will also be contributing this year to the GCOS Implementation Plan.

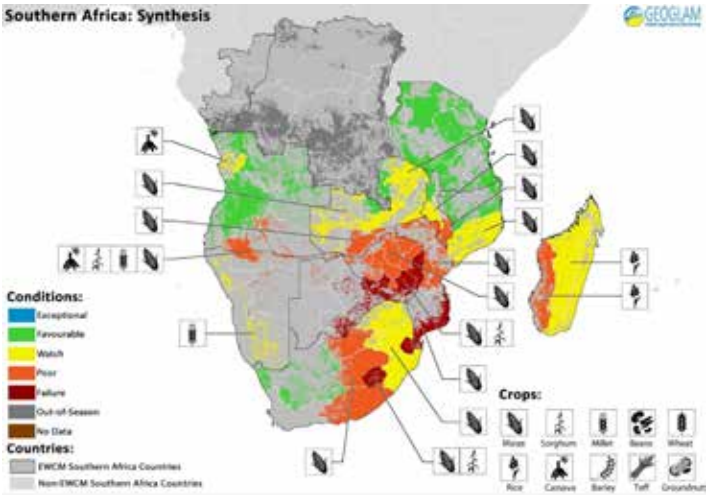
A New Tool to Fight Food Insecurity

The Group on Earth Observations (GEO) announced, during its 36th Executive Meeting held in Geneva from 8 to 9 March, the launch of the Early Warning Crop Monitor, a new tool to fight food insecurity. Developed by the GEO Global Agricultural Monitoring Initiative (GEOGLAM), the Early Warning Crop Monitor provides consensus reports on crop conditions in countries at risk of food insecurity in Central and South America, Africa, the Middle East, and Central and East Asia. Many of which, in Southeast Asia and even more so in Southern Africa, are currently facing severe droughts, which have been attributed to the on-going El Niño.

The Early Warning Crop Monitor, together with the GEOGLAM Crop Monitor for the Agricultural Market Information Service, will ultimately monitor crop development in 124 countries, totalling about 94 per cent of the world's agricultural area. Both reports synthesize remote sensing data, field observations and environmental modelling conducted by more than 40 international, regional and national organizations. The

monthly reports are made available to decision-makers across the food security community and to the commodities markets.

Dr Kathryn Sullivan, Administrator of the US National Oceanic and Atmospheric Administration (NOAA) and GEO Co-Chair, stated, "Concerns over food and water security are rising globally. Ensuring that agricultural industries around the world have access to the best science, data, tools and resources is essential as we work to increase food security and mitigate the effects of droughts and floods. The GEOGLAM Early Warning Crop Monitor provides decision-makers with essential information, gathered from satellites, buoys and other observational tools, to be ready, responsive and resilient against extreme weather and water events."



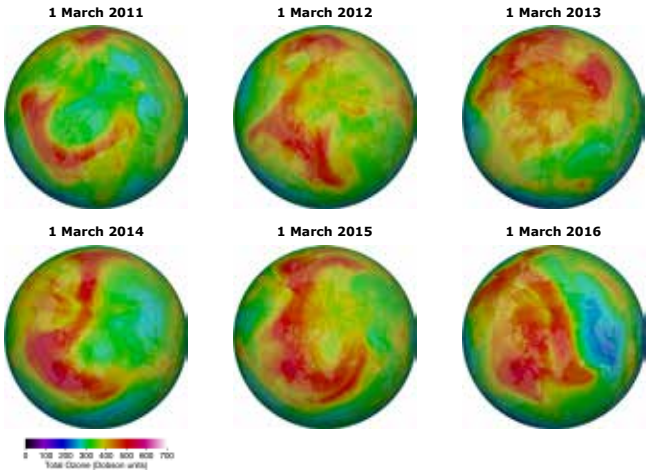
Crop conditions map synthesizing information for all Early Warning Crop Monitor crops as of 28 February. Crop conditions over the main growing areas are based on a combination of inputs – from remotely sensed data, ground observations, field reports, national and regional experts and more. Crops that are in other than favourable conditions are displayed on the map.

For more information visit www.geoglam-crop-monitor.org.

Unusually cold stratosphere causes substantial ozone loss in the Arctic in 2016

The Antarctic ozone hole is an annually recurring phenomenon, and every year a substantial amount of ozone is destroyed during the Austral spring from September to November. In the North, on the other hand, the variations from year to year are much larger: Some years experience almost no depletion of the stratospheric ozone layer, whereas other winters/springs suffer a significant degree of ozone loss.

The largest ozone loss experienced so far in the Arctic happened in 2011 when the chemically-induced ozone column loss at the end of March reached 38%. The degree of stratospheric ozone loss in the Polar Regions depends to a large extent on the meteorological conditions. The amounts of ozone depleting gases – chlorofluorocarbons (CFCs) and halons – in the stratosphere peaked around year 2000, then slowly started going down. The three ingredients needed to cause ozone loss are 1) chlorine and bromine released from the CFCs and halons, 2) low temperatures and 3) sunshine. The stratosphere still contains more than enough CFCs and halons to cause total destruction of ozone in the 15-20 kilometre altitude interval if the two other ingredients are present. This means that the degree of ozone loss will depend on the temperature conditions and for how long the low temperatures persist into the spring when the sun comes back after the polar winter. Low temperatures give rise to a special kind of clouds, so-called polar stratospheric clouds (PSCs). On the surface of these cloud particles, chemical reactions take place that convert innocuous halogen compounds into active chlorine (ClO) that is very efficient at destroying ozone.



Maps of total ozone for the date of 1 March for the time period from 2011-2016.

The 2015/16 stratospheric winter has been characterized by record low temperatures in January, and the occurrence of PSCs has been much more widespread than in recent years. In early March, the chemically-induced ozone loss amounted to 28% of the total column. However, a major stratospheric warming event, which started in early March, precluded further ozone loss. A chemically-induced total ozone loss of 28% ranks the 2015/16 winter as the third most serious on record, behind 1994/95 (30%) and 2010/11 (38%). It should be noted that the 2016 results are preliminary. More details about Arctic ozone loss can be found in the WMO Arctic Ozone Bulletin at www.wmo.int/pages/prog/arep/WMOArcticOzoneBulletins2016.html.

WMO Celebrates International Women's Day

WMO celebrated International Women's Day on 8 March by highlighting the outstanding work performed by female meteorologists, hydrologists, climatologists and scientists around the world. This 2016 theme was Planet 50-50 by 2030: Step It Up for Gender Equality. Given that women are significantly underrepresented in meteorology and related professions – especially at top levels – WMO is working towards eliminating barriers to entry and retention of women in scientific careers, attracting more girls into studying science and increasing their numbers in WMO governance and management.

"Investments made in women and girls are great multipliers of development progress," said WMO Secretary-General Petteri Taalas, who recently joined the ranks of the Geneva Gender Champions with a commitment to promote a gender-sensitive culture in WMO and to strive for gender parity. "In a world of diminishing resources, we must use human capital wisely and strategically. We must take full advantage of the capacity of both women and men to advance our objectives," he said.

WMO continues to promote the production of gender sensitive weather and climate services. Among other activities, its field school for farmers specifically reaches out to women in agriculture, while its guidance on gender-sensitive flood management reflects the unique needs and strengths of women as well as men.

"Women are more affected by disasters although they are more risk averse than men, so we need gender-sensitive weather and climate services," noted WMO Assistant Secretary-General Elena Manaenkova,

who was recently selected by the Geneva Environment Network as an "inspirational" woman. "The strength of women as champions to help communities adapt to climate change and be more resilient to disasters is undervalued," said Ms Manaenkova. "This needs to change."

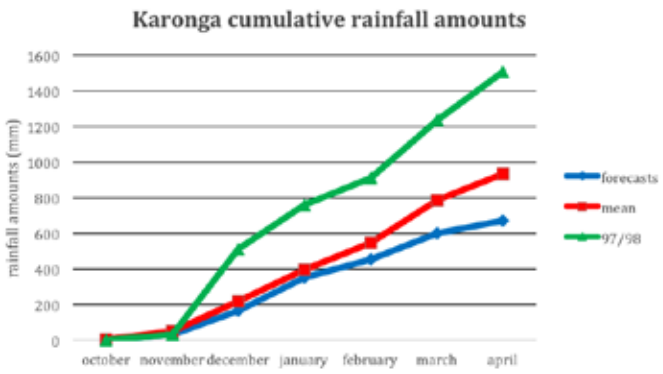
As part of its activities on 8 March, WMO compiled an extensive Women in Action album with dozens of photos illustrating the remarkable work done by women at National Meteorological and Hydrological Services, often performed in remote areas and in challenging conditions.

From the WMO Flickr Album, Women at Work, Kathrin Höppner, an Air Chemist at the German Research Station "Neumayer III", Queen Maud Land, Antarctica.

Downscaling Seasonal Forecast in Malawi and Tanzania

In 2015, the Tanzania Meteorological Agency (TMA) and the Malawi Department of Climate Change and Meteorological Services (DCCMS) embarked on a pilot project to downscale the Seasonal Forecast to the district level under the Global Framework for Climate Services (GFCS) Adaptation Programme in Africa. The initiative followed survey results that showed that users found the existing seasonal forecasts too general to be useful in informing actions and decisions.

In Malawi, the seasonal forecast for the unimodal rainy season starting in October 2015 was downscaled to all 22 districts in the country with technical support provided by the Finnish Meteorological Institute (FMI). The forecasts included information on the onset and cessation of rain, as well as on the probability of dry spells within the season. The forecasts also included a graph on the cumulative rainfall with information on analogue years (for an example, see graph below).



In Tanzania, the seasonal forecast for the October, November and December was downscaled for the districts of Longido, Kiteto and Kondoa, and issued in Kiswahili. The forecasts included advisories for health, agriculture and food security, water and disaster risk reduction (DRR).

In both countries, the Meteorological Services and their partners intensified dissemination efforts to users at the district level. Intermediaries trained by the World Food Programme (WFP) and the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) – in an approach that uses both historical climate information and seasonal forecasts to support decision-making at the household level for smallholder farmers – joined this effort.

Initial feedback from users was positive. Surveys are being conducted to determine how users were able to act on the forecasts. Verifications will be made to determine the skill of the forecasts and to provide feedback for future downscaling. The aim is to make such downscaling the norm in both Tanzania and Malawi.

Facilitating the use of new Himawari-8 satellite data

A project jointly-implemented by WMO and the Japan Meteorological Agency (JMA) has now provided satellite data receiving and processing systems to nine countries in East Asia and the Western Pacific Region. These systems will permit the countries in question to use data from Himawari-8, the new generation geostationary JMA meteorological satellite launched in October 2014, which became operational in July 2015.

The satellite is located at around 140 degrees east, observing East Asia and the Western Pacific. The most valuable function of geostationary meteorological satellites is their ability to monitor atmospheric phenomena continuously and uniformly over areas where surface-based observation is difficult such as seas, deserts and mountains. With the enhanced 16-band (channel) observation capability, Himawari-8 is expected to improve meteorological services by National Meteorological and Hydrological Services in the region for weather forecasting, climate monitoring, disaster risk reduction and safe transportation.

The imagery data derived from Himawari-8 and JMA's numerical weather prediction products are distributed to users via an Internet cloud service and a communication satellite (HimawariCast). In order to facilitate the reception of Himawari-8 data for operational meteorological services in developing countries in the region, JMA in cooperation with WMO has implemented a project to install HimawariCast receiving and processing systems. Installation of the systems has been recently completed in nine countries: Bangladesh, Cambodia, Federated States of Micronesia, Myanmar, Palau, Papua New Guinea, Thailand, Tuvalu and Viet Nam.

In addition, JMA experts have started visiting the recipient meteorological services to conduct training seminars to maximize the benefit

they can derive from Himawari-8 data. It is expected that the systems installed throughout this project will further improve capability in early detection of, and responses to, severe weather events in these countries.

New Polar Challenge Launched

Wanted: Autonomous vehicle for 2 000 kilometre mission under sea-ice

Reward: 500 000 Swiss francs

During the Arctic Science Summit Week, 12–18 March in the United States of America (US), the World Climate Research Programme (WCRP) and the Prince Albert II of Monaco Foundation, in affiliation with the Association of Hydro-Meteorological Equipment Industry (HMEI) as an industry partner, launched a Polar Challenge to reward a 2 000 km data-collection mission under the sea ice in the Arctic or Antarctic with an Autonomous Underwater Vehicle (AUV). Their aim is to stimulate the development of a much-needed monitoring tool for the Polar regions to complement satellite observations, and ultimately expand scientific research capabilities and climate services in both the Arctic and Antarctic.

"Polar observations are vital in order to improve our understanding of the frozen cryosphere, which is a key indicator of environmental change and which, in turn, has a major influence on the global climate," emphasized WCRP Director David Carlson. "With the Polar Challenge, we hope to open new horizons in under-ice navigation, endurance and environmental monitoring," said WCRP Senior Scientist Michel Rixen.

WCRP and the Prince Albert II of Monaco Foundation hope the competition will promote technological innovation towards a future cost-effective, autonomous and scalable observing network for ice-covered ocean regions based on a fleet of such platforms, similar to what ARGO, a global network of more than 3 500 free-drifting floats, has accomplished for the open ocean.

The Polar Challenge will offer the potential to develop new data sets of sea-ice and under-ice properties far into unexplored territories, revolutionizing our knowledge of heat fluxes and storage, fresh water exchanges, carbon sequestration and ocean acidification in those regions.

For further details, including competition rules and registration visit: www.wcrp-climate.org/polarchallenge.

Polar Prediction a Priority for Polar Space Task Group

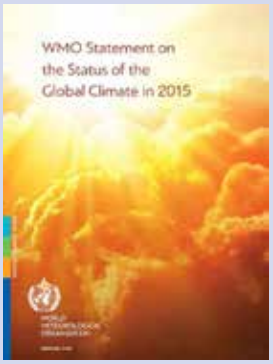
Polar regions and the cryosphere constitute unique, valuable, yet extremely sensitive components of the Earth system. Obtaining robust, routine information products for better scientific understanding and development of applications in these last frontiers requires collective action, which has been coordinated by the WMO Polar Space Task Group (PSTG) since 2011. Having made notable functional and scientific achievements from 2011 to 2015, that Group has issued a new strategic plan for the period from 2015 to 2018.

The PSTG strategy prioritizes the coordination of space-based observations on specific elements of the polar regions and cryosphere – permafrost, floating ice, snow, ice sheets, ice caps and glaciers, atmosphere and polar predictions – at the appropriate time and space scales, and where feasible collocated with airborne and/or ground based measurements. In the area of polar prediction, a basic pan-Arctic observing strategy will be developed to secure routine, regular and robust year-round all-weather active microwave acquisitions at resolutions greater than 50 metres, complemented by seasonal cloud-free coverage using optical systems. This strategy will support the Year of Polar Prediction (YOPP) in the mid 2017-mid 2018 timeframe, which aims to improve polar prediction capability.

The PSTG Strategic Plan 2015-1019, which also highlights achievements from 2011-2015, is available in the WMO Library (library.wmo.int).

Newly Issued

WMO Statement on the status of the global climate in 2015, WMO No. 1167, ISBN 978-92-63-11167-8. Available in English, French, Spanish, Russian and Arabic.



We welcome your comments about MeteoWorld and look forward to hearing from you: editor@wmo.int

World Meteorological Organization
7 bis, avenue de la Paix, PO Box 2300
CH-1200 Geneva 2, Switzerland
Tel.: +41 (0) 22 730 83 14 / 83 15
Fax: +41 (0) 22 730 80 27
Internet: public.wmo.int