Gender and Information Ecosystems in Climate Change Adaptation in Rural Africa: Lessons for Nowcasting

Chris Paterson, Professor, University of Leeds

Poster Number: 1

Abstract:

This presentation reports on aspects of a collaboration between Univ. of Nairobi, Univ. of Ghana and Univ. of Leeds researchers which sought to develop nuanced understandings of how local information ecosystems operate in a range of rural East and West African communities, and to assess their role in enabling women to combine indigenous and externally-sourced knowledge - such as nowcasting - in their engagement with, and pursuit of, climate change adaptation activities. Since 2019, our project has provided empirical examination of climate knowledge production in vulnerable East and West African rural communities. This research recognises local people as sources of knowledge and highlights the mismatch between technocratic climate change communication and the gendered, lived experience of adapting to climate change. We have started to understand, more deeply than prior research permitted, how indigenous knowledge circulates and combines with information from digital media and other sources in order to assist in planning adaptation to climate change. This research suggests that a hybridised approach that leverages the values of indigenous and scientific knowledge and exploits a variety of communications channels is a pragmatic path to effectively communicating climate change adaptation and mitigation among rural women.

WxUAS: A Breakthrough Data Source for Nowcasting

Ben Pickering, PhD Student, Menapia Ltd.

Poster Number: 2

Abstract:

The planetary boundary layer (PBL) evolves rapidly on diurnal cycles and in different synoptic regimes, and has direct links to high-impact weather such as convection and air quality. WxUAS (vertically-profiling multi-rotor drones with meteorological sensors) are emerging as a tool to both study the PBL and to observe routine measurements for numerical weather prediction (NWP).

Nowcasting is a particular area of weather forecasting that stands to benefit from routine automatic wxUAS profilers, since the data is collected and available in real-time, with high temporal and vertical resolution, and for a wide variety of atmospheric variables including gases and aerosols. The in-situ nature of wxUAS is crucial for efficient data assimilation and machine learning techniques—to avoid the use of complex, compute-intensive forward operators such as RTTOV employed for some remote sensing techniques.

Prior flyability research has demonstrated that automatic profiling wxUAS are capable of reaching a target altitude 2 km AMSL with 97% availability in mid-latitude climates, above the typical height of the PBL. Furthermore, wxUAS are low-cost and scale effectively as one remote operator can monitor the safe flight of a fleet of wxUAS across a network.

This poster will explore these topics further, and demonstrate the type and quality of the data observed by wxUAS. Case studies from the WesCon–WOEST field campaign in summer 2023 will be shown, where the MetSprite wxUAS developed by Leeds-based startup Menapia Ltd., flew up to 2 kg AGL during a range of frontal, stable and convective boundary layers, in a range of meteorological conditions. Novel 360º video footage on-board the MetSprite wxUAS will also be shown penetrating clouds at the PBL inversion, demonstrating the complexity of these atmospheric regions, the challenges faced by PBL nowcasting techniques, and the potential for wxUAS to address the PBL observation gap.

The Future of Satellite Nowcasting for Africa

Alexander James Roberts, Postdoctoral researcher, National Centre for Atmospheric Science, University of Leeds

Poster Number: 3

Abstract:

Africa is in need of high quality weather information. All too often this need is not met, meaning that almost a whole continent is hampered in its ability to predict and take mitigating action against the effects of high impact weather.

Tropical African meteorology is dominated by deep convective storms. Such storms are poorly represented in global numerical weather prediction (NWP) products and in high-resolution, convection-permitting simulations they pose a significant skill challenge. As such, the ability to monitor the current meteorological situation and make short term predictions (nowcasting) should be a priority across the continent. However, the prohibitive cost and technical complexity of rainfall radar systems (used for nowcasting across Europe, North America and large parts of Asia) have precluded most African countries from pursuing the same course of action. An alternative to rainfall radars for nowcasting is the use of geostationary meteorological satellite data. However, this approach has been startlingly underutilised and most African National Meteorological and Hydrological Services (NMHSs) limit their use of satellite nowcasting techniques to a mandatory role required for international aviation.

Here we discuss the work being done in Africa to: (1) encourage the use of existing satellite based nowcasting techniques, (2) understand the future of satellite nowcasting techniques for Africa and (3) overcome the present and future challenges faced by African NMHSs trying to operationalise satellite nowcasting in their countries.

Nowcasting of Convective Thunderstorms Using 3D Radar Cell Tracking

Andrew McNaughton, Earth Observation Foundation Scientist, Met Office

Poster Number: 4

Abstract:

Convective thunderstorms and their associated precipitation and flooding impacts are one of the primary meteorological hazards affecting the UK during the summer. To help produce weather warnings for the potential impacts of these storms, the Met Office has developed a convective cell tracking tool which acts as a situational awareness and forecasting tool for meteorologists. The system uses a radar derived Vertically Integrated Liquid (VIL) field, which is an estimate of the amount of water in a column of the atmosphere. By identifying areas of high VIL in a sequence of radar images, the storm cell objects can be tracked over time and short lead time forecasts.

The Mesoanalysis: A New Tool for Situational Awareness and Nowcasting at the Met Office

Matthew Richard Clark, Meteorologist, Met Office

Poster Number: 5

Abstract:

A mesoanalysis tool for situational awareness and nowcasting has recently been developed at the Met Office. The tool was designed primarily for use in convective situations, to allow operational meteorologists to anticipate areas of convection initiation. However, operational trials have demonstrated utility in a broader range of weather situations. The mesoanalysis incorporates surface observations from a range of sources including home weather stations (via the Weather Observations Website (WOW)), roadside weather stations, and the Met Office's official network of surface stations. Filtering and bias-correction are applied to the WOW data prior to use. The observations are then blended with model data using data assimilation techniques. Compared to rapid-update model cycles, the mesoanalysis has the advantage of being available in near to real time (~15 minutes latency) and does not suffer from spin-up problems. Furthermore, the analysis can be weighted more closely to the observations than is possible when running assimilation schemes for a full physical model. In this poster, some details of the observations processing will be provided, and some examples of the mesoanalysis fields will be presented to illustrate how the tool can be used to aid situational awareness and nowcasting.