

Faculty of Science and Technology Inaugurates Weather and Climate Science Laboratory Supported by UK-GCRF African SWIFT Project





Prof M.J Hutchinson [Chief Guest]. On her right are: Prof Francis Mulaa [Associate Dean, Faculty of Science and Technology] and Kennedy Thiongo [Deputy Director, Kenya Meteorological Department]. On her left is Prof Daniel Olago [Chair, Department of Earth and Climate Sciences].

Speaking during the launch of the SWIFT-NESST Laboratory at the Meteorology unit, Prof Hutchinson, the Associate Vice Chancellor- Research, Innovation and Enterprise (AVC-RIE) reminisced about the unpredictability of rainfall distribution in both space and time and the challenge that it posed on the agricultural activities like planting season during her tenure as an agricultural officer in Trans Nzoia in the 1980s. She expressed her gratitude for the recognition of the critical environmental challenges, such climate variability and climate change, facing not only Kenya but the continent of Africa. She celebrated the potential of the laboratory in the realization of timely and accurate weather forecasts, together with effective data and communication as a milestone for the UoN in research for impacts, technological transfer, and knowledge sharing as it increases the visibility of the institution. She expressed her appreciation for this effort put in towards weather and climate modeling

with high performance computing, and the potential of sharing the information derived through acquisition and analysis of real time data from satellites that can be used by the stakeholders in different organizations.

The AVC-RIE emphasized on the importance of probing how and to what extent other institutions, organizations, countries and the continent at large will harvest these amazing tools derived through intellectual input, resources and partnerships. One, as the biggest university, UoN has a mandate of mentoring the upcoming universities. The UoN, therefore, has to advance the agenda of research in Kenya, Africa and beyond. The UoN can also venture and articulate critical thinking in research so as to link it with the professional agenda. Three, the university can also help the government in planning accordingly for the looming drought that has already devastated the country of Somalia. That, she pointed out, will be a great milestone!

The AVC-RIE also pointed out that the importance of the lab will manifest way beyond the UoN and/or the other involved institutions: it will actually help advance weather forecasting for decision-making. She, therefore, challenged the stakeholders to capture and avail the information about the launch and capabilities of the laboratory to the different committees of parliament. This way, she said, the legislators can deeply appreciate the manner in which the UoN is contributing to society. She added that this will inform the legislators not only in resource allocation but also in monitoring their own development and of course the commitment that they have given to the people of Kenya.

She expressed her immense appreciation for collaborations and partnerships that culminated in the acquisition, setting up and operationalization of the lab. While acknowledging the role of uni-

versity and partnerships in promoting North-South technological transfer and uptake, West-East intra-Africa knowledge sharing, mentorship of early career researchers by the established faculty, researchers and practitioners via workshops and summer schools, the AVC-RIE appreciated the UKRI funding and the UK- Africa partnerships. She also lauded the role of academia, operations, industry and policy makers. Such cross-cutting all-inclusive collaborations often generate actionable evidence-based policies.

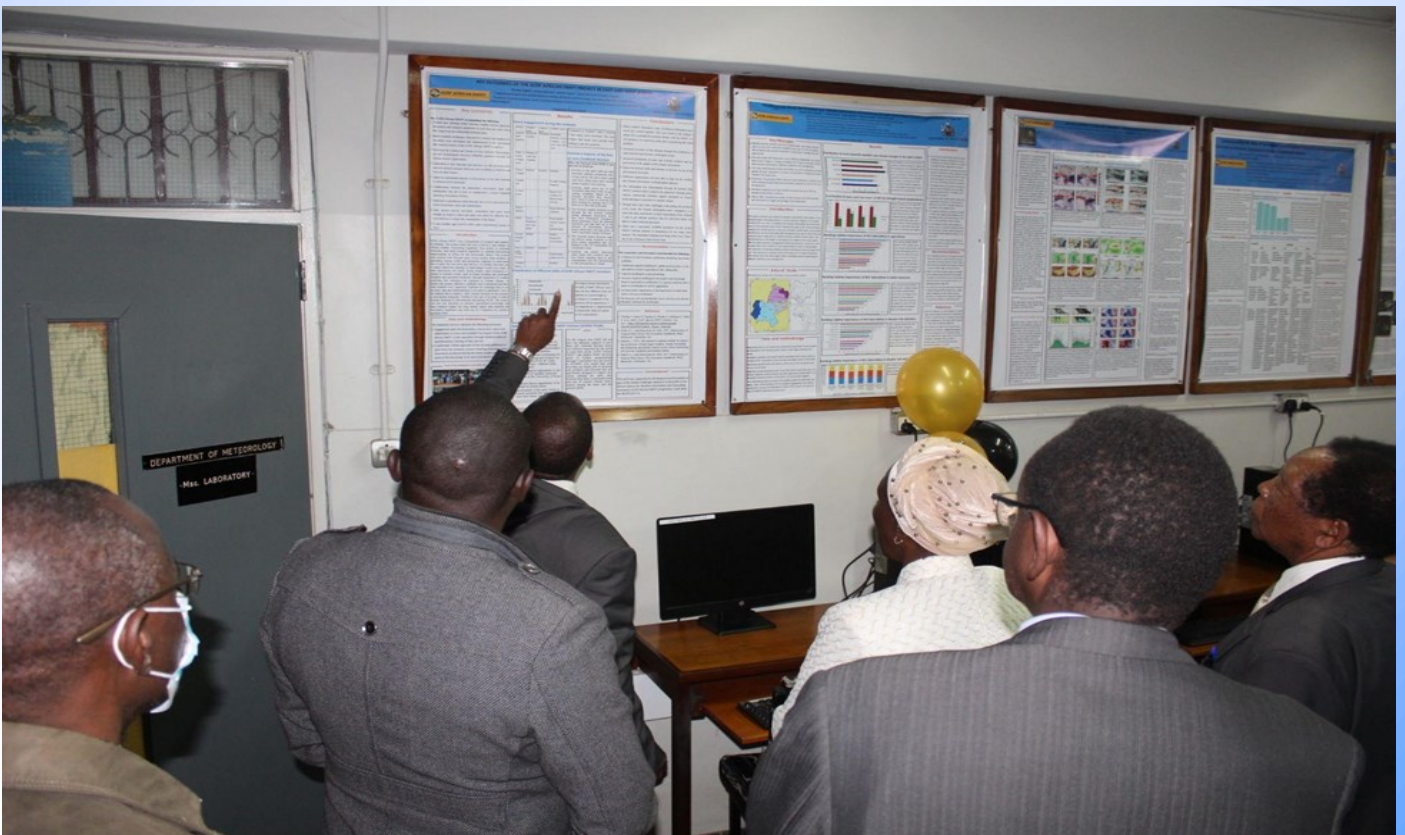
She concluded her speech by encouraging every researcher, including those visiting the UoN, to utilize the laboratory so as to enable the university have a voice approach to the economy in order to protect and secure livelihoods.



Mr. Thiongo, the Deputy Director of KMD (left), Prof Munyoki, Director of Research (center) and Prof Mulaa, Associate Dean- FST (right) witnessing Prof. Hutchinson inaugurating the Weather and Climate Science laboratory at the Meteorology Unit of the Department of Earth and Climate Sciences, Faculty of Science and Technology.



The guests viewing model and NWCSAF output running in the laboratory



Guests are given an overview of the science publications in the laboratory exhibition in the department.



Prof Francis Mulaa [Associate Dean, Faculty of Science and Technology]. On his left are: Prof Hutchinson [Chief Guest] and Prof Daniel Olago [Chair, Department of Earth and Climate Sciences]. On his right is Kennedy Thiongo [Deputy Director, Kenya Meteorological Department]

Narrating on the evolution of the teaching, training and research in science, Prof Mulaa mentioned that the former (following the recent university reforms) departments of meteorology, geography and geology are some of the earliest academic units in UoN. He revealed that the reason for them having been launched first was because the government realized their importance. Prof Mulaa demonstrated the immediate economic importance of the huge quality datasets generated by the Faculty of Science and Technology through its constituent departments. What we would like to do with this laboratory, he said, is just “setting fire”. While comparing the launch of the lab with the recent unveiling of a Global Centre in Qatar, Prof Mulaa laid bare the economic prospects of data science in this era.



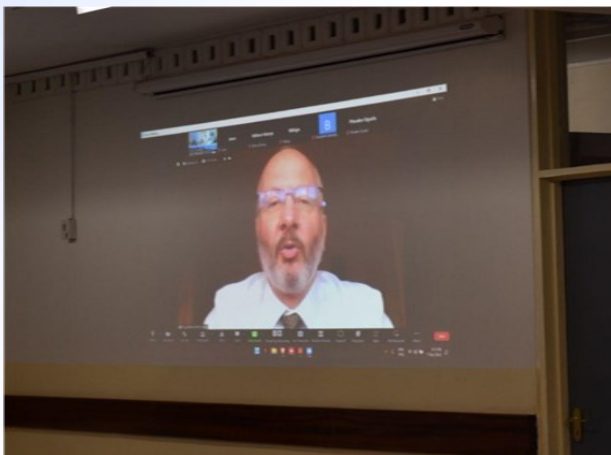
Prof. Justus Munyoki [standing] Director of Research, UoN

While acknowledging the long steady strides that Dr. Mutemi [SWIFT UoN PI] has passionately taken in the realization of the Lab, Prof Munyoki emphasized the need for communicating and marketing the subsequent research and research products for wider uptake. This way, he said, the UoN's leadership in the generation of solutions to the common national and global environmental problems will not only be realized, but a sustained funding of its core research mandate and researchers will also be achieved.



Prof. Daniel Olago [Chair, Department of Earth and Climate Sciences, FST, UoN]

Taking pride in the fact that the Meteorology Unit is domiciled within the Department of Earth and Climate Sciences, Prof Olago lauded the effort of the SWIFT CO-PI in leading the UoN team in the four-year collaborative project with UK institutions, African partners and KMD weather forecasters. He expressed optimism in the future of African scientists given the inclusion of early career researchers in such an effort. Following up on the availability and usability of NWCSAF products demonstrated during the launch, he challenged the researchers to investigate the influence of climate variability and climate change on the mesoscale drivers as manifested in the development of thunderstorms using multi-year time series.



Prof. Douglas Parker [SWIFT Lead Scientist, University of Leeds, UK]

Prof Parker stated that the lab signifies an important milestone in development of climate services in East Africa. He added that weather forecasting in the region saves lives. Citing the Lake Victoria fishermen example, he reported that nowcasting is estimated to save 300 lives annually, offering an enormous humanitarian benefit.

He stated that these lifesaving forecasts are created using tools developed in the GCRF African SWIFT project which are used for training students at the University of Nairobi and other centers in Africa.

He posed that the main question is why nowcasting in particular; the weather prediction methods for the world were developed in the Northern countries, USA and in Europe in particular but they do not work so well in the tropics since African storms develop very rapidly over a few minutes or a few hours so yesterday's forecast is always only a guide to the situation. He sums up that new forecasting methods for the global tropics are needed and the methods need to respond more quickly to severe weather as it develops.

“Therefore, what is the main theme of the laboratory?” He posed. Recalling the USD 100B that the world committed to improving tropical climate services during the COP 26, he exuded hope that more funds will be committed during the upcoming COP 27, scheduled to be held in Africa. The challenge, he posed, is how does the world make good use of such enormous funds? While everybody wants to find solutions, Prof Parker questioned how the available funds should be used in the research propositions. He stated that evidence is pointing towards the need to channel a lot of effort into co-production of better climate services with communities talking to users about what they need and the challenge is how the needs of many communities can be met.

According to Prof Parker, the solution has to lie in the strengthening of the capacity and capability of the African institutions to create the climate solutions which the community needs.

This, he said, is only possible when you have resources to provide that help, tools, expertise, computers, satellite technology and the laboratories to provide the solutions the communities

need. This means, Prof Parker added, training generations of scientists to work with data measurements, computers, atmosphere, physics, communication tools, meteorology and not reliant on the external work contributions.

On the importance of the laboratory, Prof Parker termed it as an important milestone; one, it will enable the communities in East Africa to work hands on and remotely on the data and models; two, the students will also get skills in handling data, meteorological analysis, critical thinking, and analyzing fast changing systems thus strengthening the training. He further added that the laboratory will also help in providing the students with projects for skills, enabling them to work especially in this very intellectual field.

Expressing his appreciation for the invitation to the inauguration, Prof Parker congratulated the SWIFT UoN team on the inauguration of the lab. “I look forward to collaboration with you and your future generations of students, the young people who came through to work in research or for this region”, he said.



Dr. Benjamin Lamptey [Ghanaian Meteorologist, SWIFT UK Fellow, Former Deputy Director ACMAD]

Benjamin Lamptey advises that Africans should always have a plan in place regarding developments to be undertaken within their organizations, institutions or country. This way, he stated, the identification and attainment of their research goals will easily be checked when getting involved in any international project. “By the end of the projects, the legacy of the project would be evident to all and part of the project’s big plans would have been met”, he says. Dr Lamptey opined that the laboratory will always keep the science for weather and forecasting technology project alive in the University of Nairobi.



Prof. Francis Nyongesa [Chair, Department of Physics, FST, UoN]

On whether there exists a link between the science of weather and physics, Prof Nyongesa points out the broad need for meteorologists to understand the physics of the earth's atmosphere, including its interactions with earth's surface. He opined that the use of this knowledge will enable meteorologists to make future predictions whose timeliness and accuracy is relied upon by critical sectors of the economy. He cited the unrationed power and electricity supply by the KPLC due to availability and use of seasonal forecasts as a classic example.



Prof. John Onyari [Department of Chemistry, FST, UoN]

Prof John Onyari followed through the discussion on the transdisciplinary and multidisciplinary nature of the science of meteorology. He stated that the science of meteorology is not complete without a study of the chemistry of the earth's atmosphere. He opined that knowledge gained in atmospheric chemistry can be applied in the understanding of the type, abundance and spread of pollutants and their radiative forcing. This is what drives the global warming and climate change which manifest as a perturbation in climate variables, and the geoengineering efforts proving cloud seeding technologies that seek to counter the negative effects.



Prof. Nathan Gichuki [Representing Chair, Department of Biology, FST, UoN]

Prof Nathan Gichuki testified the existence of a link between Biology and meteorology: Biology being the study of life has a link with meteorology. He explained that weather and climate influences both plant and human lives. Citing the example of birds' migration, Prof Gichuki underpinned the importance of the understanding of the influence of weather and climate on animal behavior as being important for the aviation industry where birds pose a flight safety risk.



Dr. Edwin Dindi [Senior Lecturer, Geology Unit, Department of Earth and Climate Sciences, FST, UoN]

According to Dr. Edwin Dindi, the science of geology which deals with the composition of Earth materials, structures, and processes, and that of meteorology, which is the study of the atmosphere and how processes in the atmosphere determine earth's weather and climate, have one thing in common: they share the Earth's solid boundary surface. The downward directed arm of the hydrological cycle leads rain water to recharging geothermal production systems which are a reliable green source of energy. Accurate rainfall forecast therefore means predictable and reliant geothermal energy generation.



Dr. Franklin J. Opijah [Coordinator, Meteorology Unit, Department of Earth and Climate Sciences, FST, UoN]

Representing the Meteorological Unit, Dr. F.J Opijah acknowledged the milestones that meteorology unit has made in the last few years. He highlighted that in 2019, the unit received recognition from the World Meteorological Organization (WMO) as a Regional Training Centre (RTC). He explained that RTCs are strategies that have been used by the WMO over the years to train meteorological personnel all over the world. On the significance of the Kenya RTC, he mentioned it as being one of the earliest RTCs in Africa which was initially set up in 1963 to train meteorologists in all English speaking countries in Africa. He went ahead to state that despite the several RTCs available in Africa nowadays, before the Kenya RTC, the only other RTC was the RTC in Niamey, Niger, which was established to train meteorologists in the French-speaking countries of Africa.

He mentioned that the second milestone was captured in the strategic plan that is the Unit's vision which was "To be a world class centre of innovation and research in meteorology and related sciences." The unit's strategy included establishing several laboratories that would rival any other world-class laboratories anywhere in the world where two laboratories stood out, i.e., one laboratory which was to focus on Forensic Meteorology, which he was optimistic that one day it shall be realized.

Another laboratory envisaged was to focus on modelling weather and climate, or Numerical Weather Prediction (NWP) Laboratory. He stated that the functional innovation laboratory inaugurated would serve to address the purposes of the NWP laboratory.

Talking about the chronological evolution of computers, Dr. Opijah recalled that prior to 1990, there were no computers in the departments in the entire Campus. The first desktop computer in the Department of Meteorology

was procured in 1990, or thereabout. The Campus was served by one mainframe computer at the Institute of Computer Science (ICS) by the International Computers Limited (ICL) company called Vax ran on the MAXIMOP operating system. The computer was accessed via multiple terminals and one or two central printers for the whole Campus. The irony was that just one of the desk top computers inaugurated in the Department was many times more powerful than the Vax computer in ICS. The workstations were much more powerful. He stated that if the Vax enabled most people to gain skills in computer science and programming then the new laboratory had enormous potential.

On the challenges that the Department has to contend with, Dr. Opijah highlighted one of them to be the dwindling numbers of teaching and technical staff. He explained that for any meaningful placement in the global village, sufficient human resource was necessary, thus by overcoming the obstacle, the

unit shall be able to preserve the science of meteorology in the future and keep its goals and aspirations alive.

He mentioned insufficient physical space to be the second major challenge. He went ahead to state that there was need to have space for laboratories for undergraduate students, which mainly focus on training and basic research. Another space that was also needed is for the laboratories for postgraduate students that focus on advanced research and applications.

He concluded by stating that the laboratory gives hope since it rekindles the vision of the Meteorology Unit, renews its goals, aspirations, and gives impetus to scale the heights in research, production, extension, innovation and enterprise. And for this, the university was forever indebted to the SWIFT project as a whole, and to Dr. Mutemi, who leads the Kenya team in the Swift project, in particular.



Mr. Kennedy Thiongo [Deputy Director, Kenya Meteorological Department (KMD); representing Dr. David Gikungu, Director]

In his remarks, Mr. Thiongo noted that KMD and UoN have a long standing MOU whereby UoN is the Regional Training Center (RTC) for Eastern and Southern Africa. He stressed that combining expertise and resources for both institutions could lead in answering more complex scientific questions and expanding the breadth of research. He appreciated that the products obtained from the lab will go a long way in helping KMD and UoN realize their mandate. He therefore stated that KMD will continue to advocate for collaboration with the department in order to make meaningful societal contributions in Kenya and beyond.



Dr. Joseph Mutemi, Department of Earth and Climate Sciences, SWIFT UoN-PI, moderating the presentations which highlighted the science outcomes and impacts of the GCRF African SWIFT



Ms. Karen Kirui [Early Career Researcher, Meteorology Unit, Department of Earth and Climate Sciences, FST, UoN]

In recognition that there is scarcity of data in the global south, Ms. Kirui demonstrated the validity of different datasets in aiding weather forecasting and research. She highlighted that the use of blended datasets supplement the scarce and irregular data in the East African region with satellite estimates while global reanalysis datasets combine irregular observations with models that encompass physical and dynamical processes. She demonstrated the similarity of output taken from selected representative stations as well as the circulation and dynamical processes that generate heaviest rainfall. Thus, combining blended datasets and global reanalysis datasets with in-situ observations is important in operational forecasting.



Dr. Bethwel K. Mutai [Lecturer and Research Scientist, Meteorology Unit, Department of Earth and Climate Sciences, FST, UoN]

Given that rainfall radar estimates are not widely available in Africa, rapidly growing and urbanizing population and economic activity are highly vulnerable to rapidly changing weather conditions, Dr. Mutai pointed out the enormous value and potential of nowcasting in Africa and Kenya. He emphasized that since lives and livelihoods are directly impacted by High Impact Weather (HIW) and climate-related risks, timely issuing of warnings, (of say a few hours) before an event, can enable the public and decision-makers to take action. Given the dearth of rainfall radar estimates which are not widely available in Africa, and that Numerical Weather Prediction (NWP) of Mesoscale Convective Systems (MSC) composing HIW currently has low skill over the continent. Dr. Mutai concluded that the delivery of nowcasting products are crucial for nowcasting to warn users on pending severe storms. He demonstrated the utility of NWCSAF products for practical training at UoN and University of Rwanda.



Mr. Ronald Barette [Principal Meteorologist and Operational Forecaster, Kenya Meteorological Department, KMD]

Mr. Barette demonstrated the utility of NWCSAF products for operational weather nowcasting and the practical warning of severe storms to users e.g., fishermen on Lake Victoria and flash flooding in urban areas. The usefulness of NWCSAF products was ably demonstrated in a quasi-operational forecasting environment during the novel SWIFT testbeds bringing together UoN researchers, KMD forecasters and weather and climate information and services users.



Ms. Phoebe Ogada [UoN Early Career Researcher, GCRF SWIFT Project]

Ms. Phoebe Ogada carried out an evaluation of the GCRF African SWIFT project with the aim of advancing operational knowledge and tracing research impact for a long lasting legacy. Through such an evaluation, Phoebe argues that project outputs will ensure that the forecasters, researchers and users are on a trajectory to a positive paradigm shift. She reports that the key partners to the project from Kenya jointly and conventionally implemented the project by providing the necessary infrastructures, personnel, and technological innovations. She notes that the users involved were from different sectors and the impacts were demonstrated through feedback from users like KenGen who reported improved efficiency and operation output. She lists the following key project outcomes: the creation of a new working model between weather service agencies/ forecasters and research institutions in both East and West Africa, reviewed content and format of how National Meteorological and Hydrological Services (NMHSs) produce forecasts for various sectors/ applications, improved co-production skills through one-on-one interaction between all partners, users, and stakeholders, brought on board early careers service providers, researchers, and users to learn and apply new skills for effective service delivery to ensure the continuation of the future and finally the application of new weather app (FASTA APP) under experimental testing in 2022.

The audience following the proceedings



LIGHT MOMENTS







Mr. Thiong'o, Deputy Director KMD and Prof. Hutchinson cutting and sharing the strengthened partnership cake