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New measurement technologies in the Trans-African Hydro-Meteorological Observatory (TAHMO)

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The Trans-African Hydro-Meteorological Observatory (TAHMO, see www.tahmo.org) is an initiative that seeks to design, build, and operate a large network of weather stations throughout sub-Saharan Africa. Presently, a total of about 150 stations are running in ten countries (Burkina Faso, Chad, Ghana, Kenya, Malawi, Mali, Nigeria, Rwanda, Tanzania, Uganda). In some cases, the stations are part of academic initiatives but in most cases they are a more structural part of the national networks, following MoUs and data sharing policies. Stations are typically placed at secondary schools, where they serve to support STEM education. Although data are free to governments and academic researchers, TAHMO also seeks to attain financial sustainability through marketing data that are used for commercial purposes, such as agricultural marketing, insurance, and planning and operation of renewable energy resources.

In order for TAHMO to be successful, it is necessary that the stations provide high grade WMO compliant data while being low maintenance. For this reason, present stations do not have any moving parts. Windspeed and direction are measured with a 2D sonic anemometer, while rainfall is measured with a resolution of 0.05mm by counting the drops funneled through a drip point. Standard observations include incoming shortwave radiation, barometric pressure, air temperature, and relative humidity. Auxiliary sensors include GPS, compass, and accelerometer, that provide information about the quality of the installation. A more experimental lightning sensor with a range of 40km completes the sensor suite.

In addition to these sensors, the stations have the possibility to add new sensors, several of which are under development and will be presented here. These include a rainfall isotope sampler with near zero fractionation, an evapometer that tracks rainfall and reference evaporation. Based on MSc work by Gilbert Mwangi, the usage of lightning sensors in a network to track storms, is being evaluated. Other experimental sensors include consumer-grade GNSS receivers to measure atmospheric precipitable water and acoustic disdrometers. The presentation will include an active discussion part to collect new ideas.