Research

(a) Completed:

(i) Investigation of the behaviour of lightning rods under tropical thunderclouds and the utilization of lightning signatures in Agriculture for Nigeria.

(ii) Quantification of the parameters of surface energy balance equation for tropical environments.

(iii) Study of the perturbation of surface energy fluxes and meteorological parameters under different conditions.

(iv) Study of the variability of E and F region of the ionosphere in the tropical region

(v) Determination of rain attenuation of radio wave propagation in a tropical area (Nigeria)

(vi) Characterization of the rainfall structure and worst hours for Nigeria

(b) In progress:

(i) Investigation of lightning intensity in Nigeria:

Cloud-to-ground lightning discharges are the most harmful to humans, infrastructures and installations. They

bring down very high currents (~200A) and high electric fields and these can cause damage to structures,

installations and electronic equipment at the point of strike. In siting government infrastructures such as

airports, oil depots and relocation of displaced communities by natural disasters, knowledge of the frequency

of occurrence ground lightning discharges in the intended location is key. Data collection on ground lightning

discharges have started since 2019. Preliminary results revealed where the likely hotspots are. Thus the study

intends to produce lightning density map for Nigeria. It is expected that by 2025, adequate ground data would

have been collected for the production of Nigeria lightning map.

(ii) Study of surface energy fluxes: The aim of the study is to investigate the surface energy fluxes for this tropical area. Information obtained from the study will give insight into the mechanism of development of the

atmospheric boundary layer of the region. This will in turn pave way for understanding the land-atmosphere dynamics, energy exchange processes and the complex weather system of the West African sub-region. The study started in 2004 and currently analysis of experimental data collected is ongoing and is expected to be concluded in 2023.

(iii) Rain attenuation of radio signals: Attenuation of radio signals by rain in Nigeria is very complex as it varies from one geographical location to the other. The study intends to

characterize rain attenuation of radio signals for each geographical location and also determine the respective worst hours. This information is critical for the design of radio equipment operating at the 5G and higher wavebands.

An attempt will be made to develop a rain attenuation model for the country that will help radio engineers and equipment designers to design radio equipment that will be most suitable for the country. The rainfall data required for the study is being collected by TRODAN across the country since 2007. The analysis is ongoing and is expected to be concluded in 2024.