Cosmic Radiation Dose on Commercial Flights

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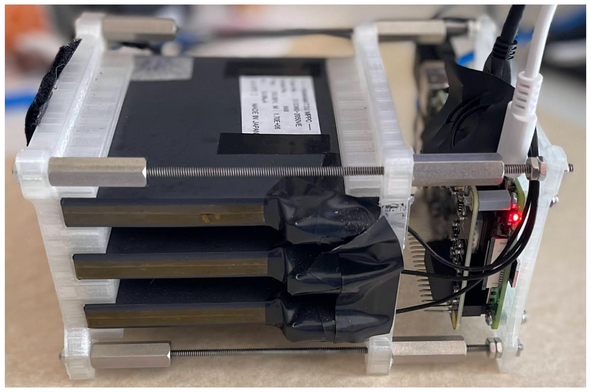
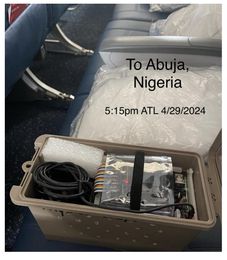
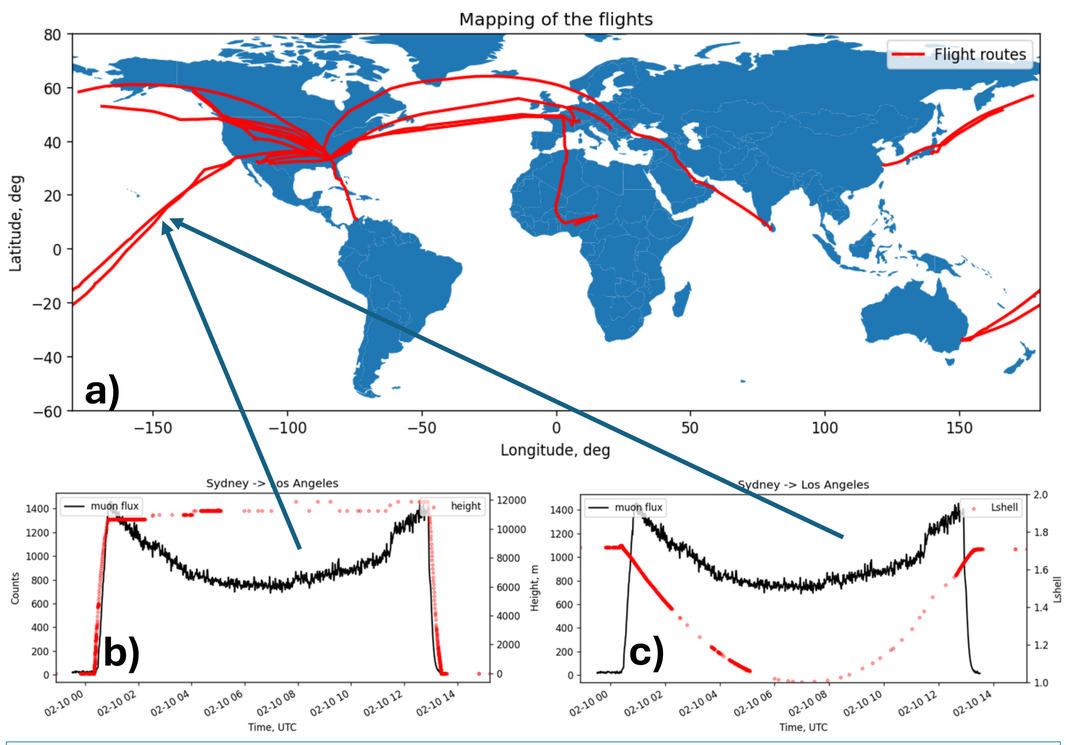
Abstract As a part of the GSU RISE project on cosmic ray studies, the team is developing prototype CubeSat detectors for measuring the cosmic ray particles in the low earth orbit. The members of the team have been measuring the cosmic ray radiation dosage on commercial flights around the world. A brief description of the detector and a few selected measurements are presented in this poster.

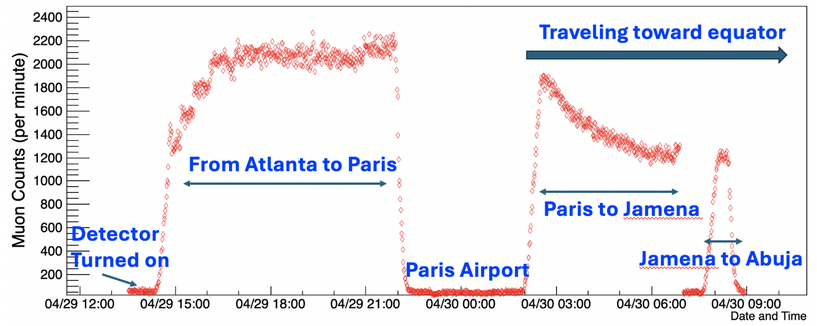
The detector consists of three layers of 9.5cm x 9.5cm x 1cm scintillators with wavelength shifting fiber glued in a groove on the scintillator. The scintillation light generated from the passing cosmic ray particle is collected by silicon photomultipliers (SiPM) mounted on the scintillators. The signals from SiPM is read out by a circuit board connected to a low-cost raspberry PI computer. Typically, total coincidence counts between the layers are recorded in every minutes with time stamp. For measurements on flights, the detector is powered by a phone battery charger and is put inside an ammo box both for protection and easy carry. Once on the plane, the box is seated under the seat.







(a) The map of the flight trajectories for which the cosmic ray muon detector measurements are obtained; (b,c) The muon measurements during the flight from Sydney, Australia to Los Angeles, USA. The flight altitude (panel b) and the L-shell (panel c) are shown in red. The muon flux shows a U-shaped pattern, indicating that the flight has crossed the geomagnetic equator.



Radiation dose from cosmic ray could reach > x40 in flight !!!

List of measurements:
USA: Seattle, Juneau, El Paso, Tucson,
South America: Colombia (Santa Marta)
Asia & Australia: Sri Lanka (Colombo), China (Shanghai), Japan (Tokyo), Qatar (Doha), Australia (Sydney)
Europe: France (Paris), Serbia (Belgrade), Netherlands (Amsterdam)
Africa: Nigeria (Abuja), Chad (N'Djamena)

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RISE at GSU - Cosmic Ray Studies
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