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Ionisation profile measured over the UK with novel energy-discriminating instrumentation

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Improved atmospheric ionisation measurements are needed to help quantify relationships between atmospheric electricity, weather and climate. Commercial interest in small particle detectors is also driving technical development of a novel scintillator-based energetic particle detector. This method is an improvement on other low-cost, low-mass detectors such as Geiger tubes in that it provides both count rate and energy discrimination, and is sensitive to almost all types of ionising radiation. It can be deployed either as a stand-alone instrument, or integrated with a meteorological radiosonde. Here we describe results obtained from a test flight over Reading, UK, in calm space weather conditions, where the new instrument was integrated with a Vaisala RS92 radiosonde, and flown alongside two Geiger counters, both sensitive to gamma and beta radiation. The flight reached an altitude of 27 km before the balloon burst, well above the Regener-Pfotzer ionisation maximum. Ionisation profiles from the count rates measured by the Geiger tubes and scintillator detector were comparable in shape. Energy information from the scintillator detector indicated a dominant effect of natural radioactivity in the boundary layer, as expected and previously observed with this instrument. Above the boundary layer, energy increased with height up to the maximum altitude reached, consistent with increasingly energetic cosmic ray ionisation.