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Development of an In-Progress Forecasting Model to Forecast Radiation Dose Rates Once a Ground-Level Enchancement has Begun

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During major solar energetic particle events, radiation dose rates in Earth's atmosphere at aviation altitudes can increase by orders of magnitude relative to dose rates during quiet times in events known as Ground-Level Enhancements (GLEs). In the case of events of a scale such that they occur once every few decades, radiation dose rates could become high enough that they pose a threat to aircraft crew and electronics. It is not currently possible to predict when such an event will occur, and existing software systems are only capable of nowcasting the current atmospheric radiation dose rates using real-time data sources. However, while it is not possible to forecast when a major event will occur, it may be possible to generate forecasts for radiation dose rates once an event has been registered to have begun. The ability to provide forecasts for dose rates once a GLE has started would be vital for airlines and for pilots in any future where aircraft might be rerouted to avoid regions of high radiation, as pilots need to be able to know not just their current radiation dose rates but radiation dose rates at possible locations where their plane might be in say half an hour's time. We report on the development of a software system to do this. This 'in-progress' radiation dose rate forecasting system will be developed by integrating the FOrecasting Relativistic particles during GLE Events (FORGE) system being developed at the University of Central Lancashire with an anisotropic extension to the Models for Atmospheric Ionising Radiation Effects+ (MAIRE+) system being developed at the University of Surrey. We report on the development of both of these systems and their integration.