

1.3-O5. Constructing a Na-22 Radionuclide Tracer Data Set and a Semi-Empirical Production Model

Cosmogenic radionuclides are often used as tracers for environmental processes, for example the three dimensional circulation of the atmosphere. The stratosphere-troposphere exchange (STE) mechanism is one important mechanism that is difficult to model and not well understood, partly due to a lack of available data of suitable tracers. The worldwide network created by the International Monitoring System (IMS) of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) is an excellent and unique tool to study atmospheric dynamics of cosmogenic radionuclides on a global scale. Na-22 has several important properties (2.6 year half-life, unique production mechanism) that make it ideal as an atmospheric tracer. However, even with high-volume aerosol samplers, it is seldom detected due to a low production rate. Employing a newly developed spectral summation technique and taking advantage of the stable energy calibration of the radionuclide detectors in the IMS network, it is possible to recover Na-22 signal and report activity concentrations. These concentrations are examined using a semi-empirical production and transport model. The resulting validated data set can then be used as input into atmospheric models to study the movement of air masses particularly when paired with a shorter-lived radioisotope such as Be-7 to function as a radiochronometer.

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