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Implications of chaos and ergodicity of the recent geomagnetic field for repeat-station reoccupation

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The present geomagnetic field is chaotic and ergodic: chaotic because it can no longer be predicted beyond around 6 years; and ergodic in the sense that time averages correspond to phase-space averages. These properties have already been deduced from complex analyses of observatory time series in a reconstructed phase space [Barraclough and De Santis 1997] and from global predicted and definitive models of differences in the time domain [De Santis et al. 2011]. These results imply that there is a strong necessity to make repeat-station magnetic surveys more frequently than every 5 years. This, in turn, will also improve the geomagnetic field secular variation models. This report provides practical examples and case studies.