



On the Possible Solar Cosmic Ray Signal in Cosmogenic Isotope Data

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The majority of cosmogenic nuclides are produced by galactic cosmic rays in the Earth's atmosphere. However, the flux of energetic particles bombarding the Earth can increase by orders of magnitude during strong solar energetic particle events. The question whether such strong sporadic events may leave their signatures in cosmogenic isotopes was studied earlier but the conclusions were contradictory. We have performed a detailed numerical study of a possible signal from a strong solar particle event in annual ^{14}C (tree rings) and ^{10}Be (polar ice) data. It is shown that the contribution of solar cosmic rays into the globally mixed ^{14}C is negligible on average, and a strong solar flare similar to that of 23-Feb-1956 would produce a 4 % increase in the annual ^{14}C production rate. The contribution of solar cosmic rays is more important for polar ^{10}Be , about 4 % on average, and the flare of 23-Feb-1956 would cause an increase of the annual polar ^{10}Be production of about 20 % which is a detectable quantity. Our conclusion is that strong solar energetic particle events may be visible in the polar ^{10}Be data, probably resulting in 5.5-years quasi-periodicity for some solar cycles. This study does not include the effect of galactic cosmic ray suppression (Forbush decrease) often accompanying solar proton events which would further decrease the estimated effect.