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Space weather influence on the Earth's ecosystems and economics state

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In this work we search of possible manifestation of solar activity through Heliosphere and cosmic rays state on the Earth ecosystems, resulted in agriculture production. We use approach to possible connection in this system as to scheme with nonlinear transition elements that has as basic property any threshold type of sensitivity with dominate expected manifestation in wheat prices bursts.

Two type of causal connection between price level and state of solar activity may be observed: 1) Time intervals between price bursts on the wheat may have the same statistical properties as time intervals between correspondent phases of sunspot cycle;

2) Max/Min price asymmetry with systematic difference between wheat prices in Minimum and Maximum states of solar activity may detected.

We test in previous part of our work expected manifestations for 450-years Rogers' sample of wheat prices in England (1250-1700) and showed that both 2 kinds of manifestations has place in the sample**.** We compared statistical properties of the intervals between wheat price bursts during years 1249-1703 with statistical properties of the intervals between the minima of solar cycles during years 1700-2000. We show that statistical properties of these two samples are similar, both for characteristics of the distributions and for histograms of the distributions. We analyze a direct link between wheat prices and solar activity in the 17th century, for which wheat prices and solar

activity data (derived from 10Be isotope) are available. We show that for all 10 time moments of the solar activity minima the observed prices were higher than prices for the corresponding time moments of maximal solar activity (100% sign correlation, on a significance level $< 0.2\%$). We consider these results a direct evidence of the causal connection between wheat prices bursts and solar activity.

We test discovered connection on the another independent 700-years database of consumables basket prices in Medieval England and show that statistical properties of the interval distribution between bursts of these prices are very close to the properties of interval distribution between sunspots minimum states (like to wheat prices bursts). In

In tne final part of this work we search possible manifestation of discovered connections for conditions of Modern Time economics. We show that wheat price level in USA during 20-th century show reliable Max/Min price asymmetry synchronized with sunspot cycle. We discuss possible explanations of the observed effects and possible applications.

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