SOLAR VARIABILITY AND EARTH’S CLIMATE

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The purpose of this lecture is to investigate whether it is possible to found a solar signature on the Earth’s climatic changes over long period of times. Recent studies indicate that small but persistent variations in solar energy flux may play a role in climatic changes; one of the most important concerns are the changes in the irradiance. If it is known that the irradiance variability have an effect on the upper UV layers on the atmosphere of the Earth, the mechanisms that redistribute this variability on the lower layers, seat of the climate, are not well known. We will discuss here some aspects which are currently at the basis of some interesting scientific debates. The first one points out the irradiance modeling, for which it is not exclude that small variations (but temporally unrelenting) of the solar radius may contribute for a non negligible part of the irradiance changes. We will show how recent measurements of the solar shape (the helioid), well explained theoretically, affect solar luminosity models. Such valuable models of the irradiance are obviously valuable inputs on the stratosphere. To this respect, a remarkable new correlation, between irradiance and the stratospheric temperature, will be presented. The second point will address new indications of the solar origin in the total atmospheric angular momentum (AAM) of the entire Earth. It is not impossible that solar-AAM-climate connections are possible in modulating solar effects on flow interactions in the atmosphere. These could, for example, account for mechanisms by which climate system can amplify a weak solar input. In the last section of this lecture, we will present how future space measurements (PICARD satellite) will contribute to set up new insights into the problem of climate variability, mainly by accurately measuring the so-called W parameter (ratio between irradiance and diameter relative variations).