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The use of neurofuzzy modeling approaches to approximate missing data in database of solar activity indices to analyze and model space weather phenomena

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Nowadays, space weather hazards have become a threat due to their effects on technologies such as satellites, power systems, etc. which modern human life is truly dependent to these technologies. Therefore, design of reliable alerting and warning systems is of utmost importance and international collaboration is needed to develop accurate prediction methodologies before the next strikes. Among the various conditions that affect space weather, the sun-driven phenomena dominate the others. Therefore, many solar and geomagnetic indices have been saved by several satellites and earth stations to model the sun and magnetosphere systems to develop powerful alarm systems to avoid such hazards. Unfortunately, this saving mechanism is not perfect and some of solar activity indices have been missed especially during storm time. It is shown that the cyclic solar activity has chaotic characteristics especially during storm time and it is not possible to propose a model for long-term prediction of solar activity indices. Therefore, it is obvious that missing data in several steps during storm times reduces the quality of models and alarm systems especially for data driven modeling approaches. In this paper, it is tried to estimate these missed data via powerful lo-

cally linear neurofuzzy models as nonlinear system identification approaches. After estimating missed data, an alarm system is proposed to avoid space weather hazards by long-term prediction of solar activity indices via neurofuzzy models. Simulation results depict the power of the alarm system which uses estimated missed data in prediction of space weather hazards.