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Monitoring of seismic time-series with advanced parallel computational tools and complex networks

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Earthquakes have been in the focus of human and research interest for several centuries due to their catastrophic effect to the everyday life as they occur almost all over the world demonstrating a hard to be modelled unpredictable behaviour. On the other hand, their monitoring with more or less technological updated instruments has been almost continuous and thanks to this fact several mathematical models have been presented and proposed so far to describe possible connections and patterns found in the resulting seismological time-series. Especially, in Greece, one of the most seismically active territories on earth, detailed instrumental seismological data are available from the beginning of the past century providing the researchers with valuable and differential knowledge about the seismicity levels all over the country. Considering available powerful parallel computational tools, such as Cellular Automata, these data can be further successfully analysed and, most important, modelled to provide possible connections between different parameters of the under study seismic time-series. More specifically, Cellular Automata have been proven very effective to compose and model nonlinear complex systems resulting in the advancement of several corresponding models as possible analogues of earthquake fault dynamics. In this work preliminary results of modelling of the seismic time-series with the help of Cellular Automata so as to compose and develop the corresponding complex networks are presented. The proposed methodology will be able to reveal under condition hidden relations as found in the examined time-series and to distinguish the intrinsic time-series characteristics in an effort to transform the examined time-series to complex networks and graphically represent their evolvement in the time-space. Consequently, based on the presented results, the proposed model will eventually serve as a possible efficient flexible computational tool to provide a generic understanding of the possible triggering mechanisms as arrived from the adequately monitoring and modelling of the regional earthquake phenomena.