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Can we predict the onset of solar flare?

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Solar flare is the biggest explosion in our solar system, and it greatly affects the terrestrial environment. Therefore, the prediction of flare onset is highly required for space weather forecast. However, the physics-based model has hardly been able to predict when and where flare will occur. Here, in order to improve the predictability, we like to propose a new type of numerical experiment, in which Hinode's data is directly used for the photospheric boundary condition. It will be demonstrated that the numerical experiments well reconstruct the flare process of 2006 December 13 by imposing different perturbation on solar surface. Using the results, we can evaluate the vulnerability of active region by analyzing the relation between the imposed perturbation and the liberated energy due to magnetic reconnection. Though it is still preliminary, the numerical experiments indicate that the data-driven simulation can provide crucial information particularly on the possible location of imminent flare.

Keywords: space weather, solar flare, prediction, simulation, modeling