M14a An investigation into the initiation mechanism of a solar flare based on the observations of photospheric magnetic fields by Hinode

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The solar photosphere is a special place where a lot of observational information on plasma motions and magnetic fields is available. The photospheric activity shown by solar plasma presents a key to understanding the mechanism for energetic phenomena such as flares observed in the solar atmosphere. These phenomena could give a significant impact on the solar-terrestrial environment. In this talk we focus on how the photospheric activity relates to the initiation of a flare using fine-scale observations provided by Hinode. The analysis of observed data demonstrates that the photospheric evolution of an active region (NOAA 10930) takes several distinct phases toward causing a flare. The evolution starts with the translation of a small positive polarity region composing the active region, which moves at about 70 m/s around a large sunspot of negative polarity in this active region. The positive polarity region then shows elengation and rotation, and eventually it almost stops near the sunspot but is subject to severe deformation. An X-class flare occurs during the thrid phase of deformation. We show the detailed nature of each of these phases and discuss how the active region accumulates free magnetic energy that is used to cause the flare.