# Reversed Rotation of the Sunspot and the X2.1 Flare in the Active Region NOAA12297

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We study the evolution of the magnetic field of the active region NOAA 12297 before and after the X2.1 flare. The main sunspot of this region rotated in a clockwise direction in the initial stage. After very rapid flux emergence between the sunspot and another emerging region, shear flow was enhanced and this sunspot started to rotate counterclockwise. This motion of the sunspot injected magnetic helicity opposite to global magnetic twist of the active region. As the magnetic flux emerged, the rotational speed got faster by Lorentz torque and magnetic non-potentiality developed. The rotational rate reached ~2.5 deg/h at the fastest. Soon after the occurrence of the X2.1 flare on 2015 March 11 the rotation rate began to decrease, and other physical parameters changed their behaviour. On 2015 March 13, the sunspot rotated in a clockwise dairection again. Based on this observation, we advocate that not only the flux emergence near the sunspot, but also the rotation of sunspot is needed for energy build-up and the occurrence of great flares. Our result implies that helicity injection opposite to that of the global structure is important for destabilization of magnetic field or the onset of solar flares.

Keywords: Sun, Flare, Sunspot, Energy build-up, Magnetic helicity

 