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An extreme coronal mass ejection and consequenses for the magnetosphere and Earth

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A "perfect" ICME could create a magnetic storm with intensity up to the saturation limit (Dst $\sim$ -2500 nT), a value greater than the Carrington storm. Many of the other space weather effects will not be limited by saturation effects, however. The interplanetary shock would arrive at Earth within $\sim$12 hrs with a magnetosonic Mach number $\sim$45. The shock impingement onto the magnetosphere will create a SI+ of $\sim$234 nT, the magnetic pulse duration in the magnetosphere will be $\sim$22 s with a dB/dt of $\sim$30 nT s-1, and the magnetospheric electric field associated with the dB/dt $\sim$1.9 V m-1, creating a new relativistic electron radiation belt. The magnetopause location of 4 Re from the Earth's surface will allow expose of orbiting satellites to extreme levels of flare and ICME shock-accelerated particle radiation. The results of our calculations are compared with current observational records. Comments are made concerning further data analysis and numerical modeling needed for the field of space weather.