Solar Cycle Prediction

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Solar cycle predictions are needed to plan long-term space missions; just like weather predictions are needed to plan your next vacation. Fleets of satellites circle the Earth collecting many types of science data, protecting astronauts, and relaying information. All of these satellites are sensitive at some level to solar cycle effects. Predictions of drag on LEO spacecraft are one of the most important. Launching a satellite with less propellant can mean a higher orbit, but unanticipated solar activity and increased drag can make that a Pyrrhic victory. Energetic events at the Sun can produce crippling radiation storms that endanger all assets in space. Testing solar dynamo theories by quantitative predictions of what will happen in 5-20 years is the next arena for solar cycle predictions. I will describe the current state of solar cycle predictions and anticipate how those predictions could be made more accurate in the future.