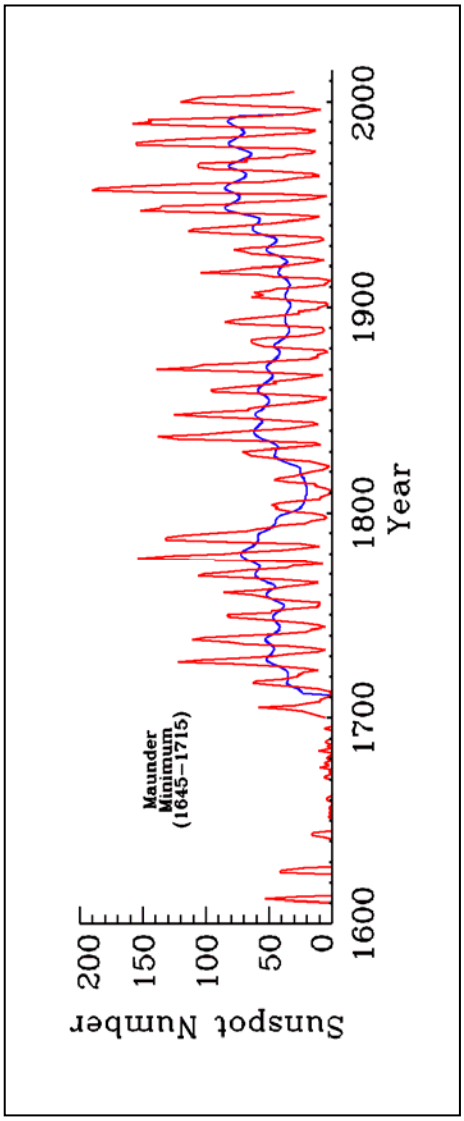
Are you ready for Sunspot Cycle 24?

In 2007, the best estimates and observations suggested that we had just entered sunspot minimum, and that the next solar activity cycle might begin during the first few months of 2008. In May, 2007, solar physicist Dr. William Pesnell at the NASA, Goddard Spaceflight Center tabulated all of the current predictions for when the next sunspot cycle (2008-2019) will reach its peak. These predictions, reported by many other solar scientists are shown in the table below.

Table: Current Predictions for the Next Sunspot Maximum

Author	Prediction Year	Spots	Year	Method Used
Horstman	2005	185	2010.5	Last 5 cycles
Thompson	2006	180		Precurser
Tsirulnik	1997	180	2014	Global Max
Podladchikova	2006	174		Integral SSN
Dikpati	2006	167		Dynamo Model
Hathaway	2006	160		AA Index
Pesnell	2006	160	2010.6	Cycle 24 = Cycle22
Maris & Onicia	2006	145	2009.9	Neural Network Forecast
Hathaway	2004	145	2010	Meridional Circulation
Gholipour	2005	145	2011.5	Spectral Analysis
Chopra & Davis	2006	140	2012.5	Disturbed Day Analysis
Kennewell	2006	130		H-alpha synoptic charts
Tritakis	2006	133	2009.5	Statistics of Rz
Tlatov	2006	130		H-alpha Charts
Nevanlinna	2007	124		AA at solar minimum
Kim	2004	122	2010.9	Cycle parameter study
Pesnell	2006	120	2010	Cycle 24 = Cycle 23
Tlatov	2006	115		Unipolar region size
Tlatov	2006	115		Large Scale magnetic field
Prochasta	2006	119		Average of Cycles 1 to 23
De Meyer	2003	110		Transfer function model
Euler & Smith	2006	122	2011.2	McNish-Lincoln Model
Hiremath	2007	110	2012	Autoregressive Model
Tlatov	2006	110		Magnetic Moments
Lantos	2006	108	2011	Even/Odd cycle pattern
Kane	1999	105	2010.5	Spectral Components
Pesnell	2006	101	2012.6	Linear Prediction
Wang	2002	101	2012.3	Solar Cycle Statistics
Roth	2006	89	2011.1	Moving averages
Duhau	2003	87		Sunspot Maxima and AA
Baranovski	2006	80	2012	Non-Linear Dynamo model
Schatten	2005	80	2012	Polar Field Precurser
Choudhuri	2007	80		Flux Transport Dynamo
Javariah	2007	74		Low-Lat. Spot Groups
Svalgaard	2005	70		Polar magnetic field
Kontor	2006	70	2012.9	Statistical extrapolation
Badalyan	2001	50	2010.5	Coronal Line
Cliverd	2006	38		Atmospheric Radiocarbon
Maris	2004	50		Flare energy during Cycle 23



Problem 1: What is the average year for the predicted sunspot maximum?
Problem 2: What is the average prediction for the total number of sunspots during the next sunspot maximum?
Problem 3: Which scientist has offered the most predictions? Do they show any trends?
Problem 4: What is the average prediction for the total sunspots during each prediction year from 2003 to 2006?
Problem 5: As we get closer to sunspot minimum in 2008, have the predictions for the peak sunspots become larger, smaller, or remain unchanged on average?
Problem 6: Which methods give the most different prediction for the peak sunspot number, compared to the average of the predictions made during 2006?

Answer Key:

Problem 1: What is the average year for the predicted sunspot maximum?
Answer: There are 21 predictions, with an average year of 2011.3.
This corresponds to about March, 2011.

Problem 2: What is the average prediction for the total number of sunspots during the next sunspot maximum?
Answer: The average of the 39 estimates in column 3 is 116 sunspots at sunspot maximum.

Problem 3: Which scientist has offered the most predictions? Do they show any trends?
Answer: Tlatov has offered 4 predictions, all made in the year 2006. The predicted numbers were 130, 115, 115 and 110. There does not seem to be a significant trend towards larger or smaller predictions by this scientist. The median value is 115 and the mode is also 115.

Problem 4: What is the average prediction for the total sunspots during each prediction year from 2003 to 2006?
Answer: Group the predictions according to the prediction year and then find the average for that year.

2003: 110, 87 average = 98

2004: 145, 122, 50 average= 106

2005: 185,145,80,70 average= 120

2006: 180,174,167,160,160,145,140,130,133,130,120,
115,115,119,122,110,108,101,89,80,70,38 average= 123

Problem 5: As we get closer to sunspot minimum in 2008, have the predictions for the peak sunspots become larger, smaller, or remain unchanged on average?
Answer: Based on the answer to problem 4, it appears that the predictions have tended to get larger, increasing from about 98 to 123 between 2003 and 2006.

Problem 6: Which methods give the most different prediction for the peak sunspot number, compared to the average of the predictions made during 2006?
Answer: Cliverd's Atmospheric Radiocarbon Method (38 spots), Badalyan's Coronal Line Method (50 spots), and Maris's Flare Energy during Cycle 23 (50 spots) seem to be the farthest from the average predictions that have been made by other forecasting methods.