Jupiter’s Shrinking Great Red Spot

Amy Simon
NASA GSFC
The Great Red Spot

Voyager 1979

Galileo 1996
The History

• Can be difficult to visually define the edges
  – Reliable observations back to the 1870s

• Noted even in the 1930s that the GRS was shrinking

• Reviewed in modern era with spacecraft data
  – Dynamical measures also show smaller size

Peek 1958
Rogers 1995
Simon-Miller et al. 2002
Asay-Davis et al. 2009
Shetty et al. 2010
Spaecraft montages

HST Oct 14, 1999, WF
HST Feb 26, 2007
HST Mar 1, 2007
HST Mar 25, 2001

HST Oct 21, 1996
HST Apr 4, 1997
HST Sep 20, 1997, WF
HST June 8, 1999

HST Feb 14, 1995
HST Feb 18, 1995
HST Oct 5, 1995
HST May 14, 1996

Voyager 1, Mar 3, 1979
HST July 15, 1994
HST July 23, 1994
HST Aug 24, 1994, WF
Not so red?

Simon et al., JGR-submitted
Amateur alert

Length of Great Red Spot, 2003-2014

Monthly means of all JUPOS data, plotted by Michel Jacquesson

Appearance of GRS:
- Blue diamonds: Variable; ill-defined N edge; dark S rim ('Voyager aspect')
- Red circles: Well-defined oval, usually orange
- Teal circles: Pale oval inside dark rim [interior diameter]

Dates:
- 20/03/2003, 19/03/2004, 19/03/2005, 19/03/2006, 19/03/2007, 18/03/2008, 18/03/2009, 18/03/2010, 18/03/2011, 17/03/2012, 17/03/2013, 17/03/2014
Jupiter and the Great Red Spot

*Hubble Space Telescope WFC3/UVIS WFPC2*
Size from Spacecraft Measurements

GRS Length with Time

Length (degrees) vs. Date

- Voyager
- HST
- Galileo
Getting rounder?
What does it mean?

- Complicated interplay with surrounding wind field and eddies
What next

• The not-so-great Red Spot?
  – Historical trend would have it round by 2030, current rate, in 5 years
    • Depends on latitude extent, as well
      – Could stabilize?
      – Could change color?
• Don’t know yet, but will be running some GCM simulations, and continue observing
• Stay tuned – more results out soon!