A New Feature on Jupiter: A Comparison with Saturn's Ribbon. A. A. Simon-Miller[1], R. Morales-Juberias[2], K. M. Sayanagi[3], P. L. Read[4], D. S. Choi[1,5]. [1]NASA Goddard Space Flight Center, [2]New Mexico Institute of Mining and Technology, [3]Hampton University, [4]Oxford University, [5]Oak Ridge Associated Universities.

Introduction: During the New Horizons flyby of Jupiter in 2007, supporting Hubble imaging showed an interesting feature near 30° N planetographic latitude, as shown in Fig. 1. This structure is very reminiscent of a feature observed on Saturn by Voyager in 1981. Visible throughout the Voyager flybys, it was dubbed the "Ribbon Feature," see Fig. 2. The main difference in these features is that the Saturn feature appears on a strong eastward wind jet, while the Jupiter feature appears on a weak westward jet. We investigate instabilities on these wind jets using the EPIC General Circulation Model, along with the persistence and structure of these features.

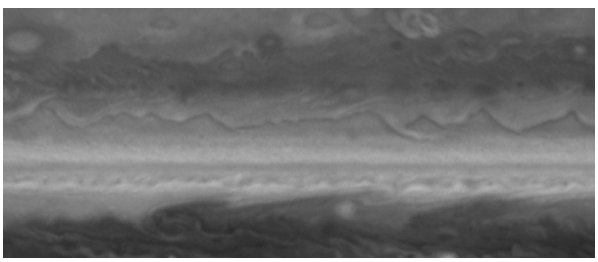

Figure 1. The Jupiter feature, as seen by Hubble in March 2007.

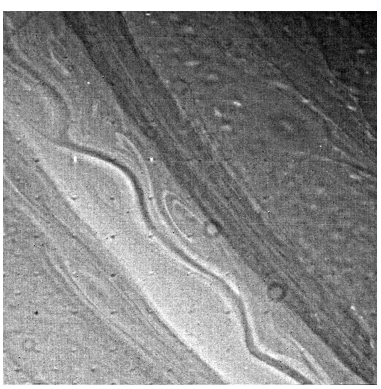

Figure 2. The Saturn Ribbon Feature at 47° N latitude, as seen by Voyager 2 in 1981 (PIA01378)

Ribbon Persistence: The Saturn ribbon was first observed in 1981 by the Voyager spacecraft. By the Cassini era (2004-present), the exact same feature was not observed, although the wind jet persists, and others are seen. A search of Hubble data from 1994-present showed no evidence of such a feature, either, although the rings encroached on the region in the late 1990s blocking visibility. There is no suitable imaging between the Voyager and Hubble eras to determine how long the initial feature lasted, however.

In comparison, Jupiter's feature was not visible in high resolution Hubble data from 1994-1998, nor in Cassini data from 2000/2001. There is a gap in high-resolution coverage between 2001 and 2006, but by 2006 it was visible at some longitudes, perhaps as it formed. It has been visible nearly continuously since then. In 2010 the feature again appeared patchy, partially obscured by convective activity, but it is strongly apparent in 2012 amateur images.

Waves and Instability: Many have previously studied the motions and structure of the Saturnian wind jet at 47° N latitude [1, 2]. Although the ribbon feature may be a wave, it does not exhibit a specific wavelength, and it is difficult to determine if it is stationary with respect to the wind jet, or if the wave and eddy activity mask the jet speed [2]. Both linear [3] and non-linear [4] modeling has shown that the jet is susceptible to dynamic instabilities, and highly dependent on the jet velocity, with the instability appearing at higher jet velocity.

A quick assessment of the wind jet velocity on Jupiter shows that it varies by up to 25 m/s from 1995 to 2007. If a similar velocity trend to that predicted on Saturn indicates the presence of the feature, we would expect to have seen the feature when velocities are highest, for example, during the 1979 Voyager flybys, and indeed, that is what we find. EPIC modeling is now being used to understand the stability of this westward jet to small variations in thermal and velocity structure.

Future work: Studies of motions can help to determine the nature of the feature, whether wave-like or not. However, there are no clear movies of its motion, yet. While visible during New Horizons flyby, global coverage was temporally sparse and only on distant approach – there was not enough coverage or resolution to study its motion clearly. Now that the feature has been found in Voyager data, it may be possible to reprocess the long global movies and study motions at this latitude. In addition, detailed structure will be studied using Hubble data at multiple wavelengths.

References:

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