Disappearance and Resurgence of Jupiter’s Southern Equatorial Band

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Physics 4110: Observational Astrophysics

Introduction
Galileo’s first look at Jupiter through a telescope sparked his evidence that our solar system was heliocentric. Since then the observation of Jupiter has become incredibly widespread and frequent. Our initial goal was to produce high resolution images of Jupiter to be used for scientific research purposes. Once obtained, these images propelled individual research focused on the rapidly reappearing Southern Equatorial Band which had “disappeared” in May 2010 for the first time since 1990. The disappearance of the SEB, the revival of this band around the planet, and its path of progression will be examined.

Results
With the traditional characteristics of resurgence in mind, evidence was found that this “ripple structure” is in fact the revival of the SEB. Through examination of our images combined with images from late November 2010 – January 2011, speculations were confirmed that the SEB was beginning to come back.

Research
Examining the images we rendered, an intriguing feature revealed itself. In the place where traditionally the Southern Equatorial Band (SEB) would lie, a ripple like structure seemed to almost enircle the planet in a spiral fashion. Upon further research it was found that this band was indeed being called the resurgence of the South Equatorial Band which disappeared in early May 2010.

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Further Discussion
Keeping the traditional three branch progression of the new SEB in mind, the mystery of the off axis SEB may be solved. The answer lies in the fact that two branches prograde and one retrogrades around the planet. The winds directly north and south of the Great Red Spot move eastward around the planet, while in between these two jet streams the winds move westward. The northern and central branches encounter this westward central stream and are deflected either upwards or downwards. The southern branch seems to be pulled along this westward moving stream causing it to remain at the same level or follow the path slightly downward. This also accounts for the rapid movement of the southern branch as opposed to the slow progression of the northern and central branches.

References
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Images Showing the Disappearance of the SEB

Figure 1: May 2010 – No SEB (Courtesy Anthony Wesley)
Figure 2: November 18, 2010 – SEB Revival Beginning (Courtesy NASA/Gemini/UC Berkeley)
Figure 3: January 12, 2011 – SEB Fully Visible

Figure 4: January 11, 2011 – Central and southern branches visibly colliding with the Red Spot