

New Horizons: A Study of Impact Craters



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Overview

- Background Information (Pluto, *New Horizons*)
- Study and Survey of Impact Craters and their Ejecta on Pluto
- Sputnik Planum Border Craters
- Search for Temporal Changes on Pluto and Charon
- Lessons Learned as an Intern
- Acknowledgements

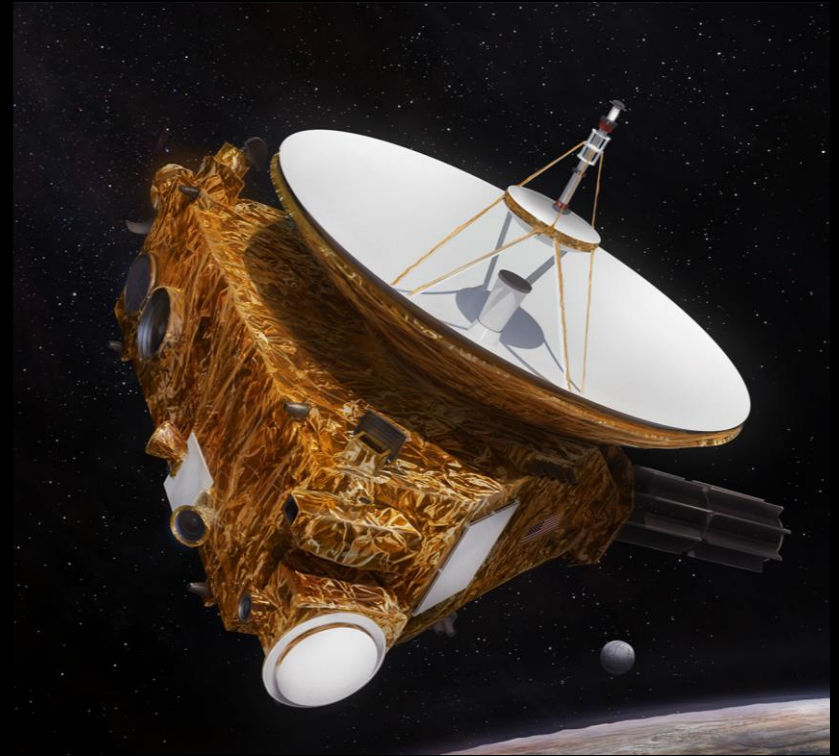
An Overview of Pluto

- Discovered February 18th ,1930
- Visited by *New Horizons* July 14th, 2015
- Kuiper Belt Object
- Dwarf Planet classification by IAU
- Surface Area: 1.77×10^7 km²
- Mass: $(1.303 \pm 0.003) \times 10^{22}$ kg
- Surface composed mainly of Ices of Water, Nitrogen, CO, and Methane.



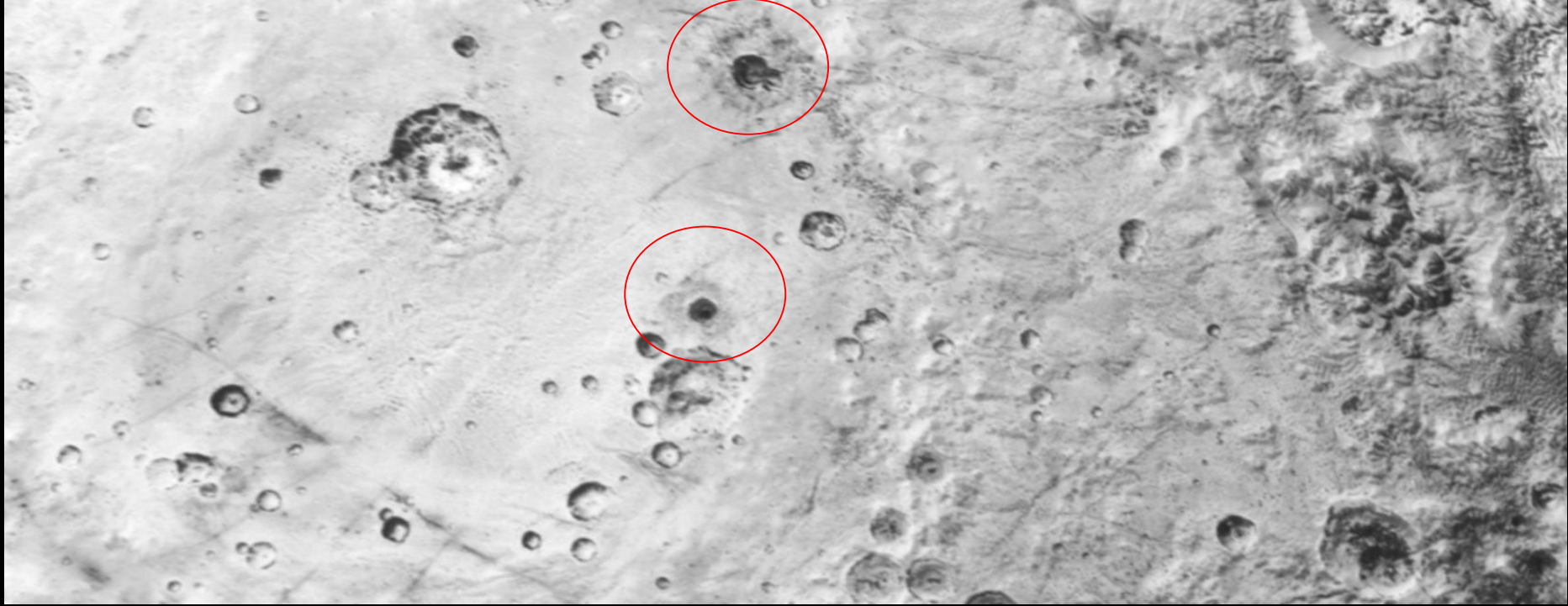
New Horizons Spacecraft Overview

- Built by JHUAPL/SWRI
- Launched on January 19th, 2006
- Visited Jupiter prior to Pluto System
- Made closest approach to Pluto July 14th, 2015 at 12,500 km from the surface of Pluto
- Suite of seven instruments to explore the Pluto system
- Currently in extended mission cruise to another KBO (2014 Mu69)
- Flyby data is still currently being downloaded via DSN



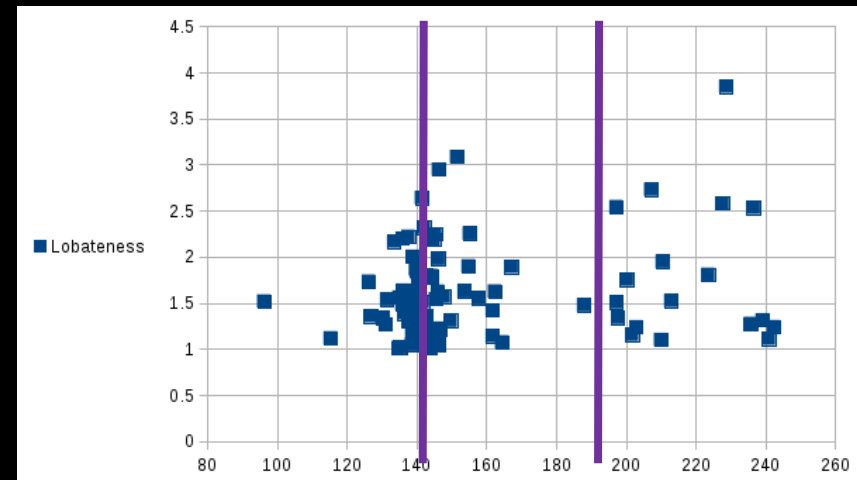
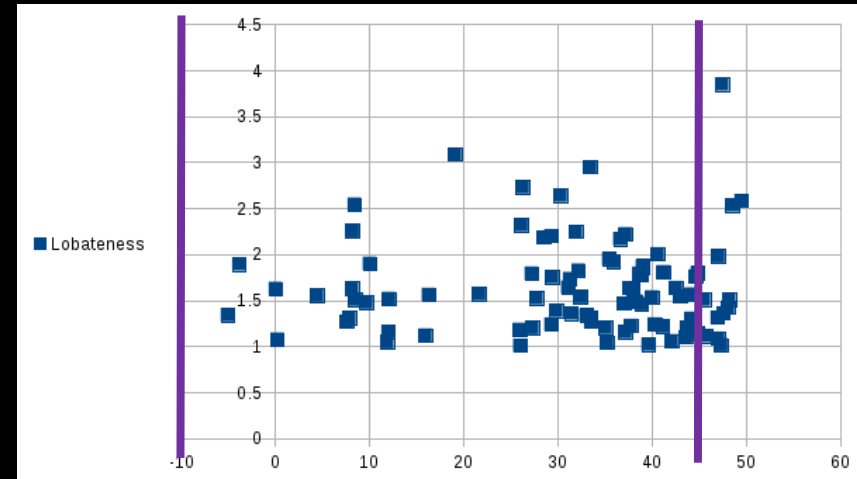
Approach to Crater Study

- Studied flyby hemisphere for significant impact craters
- Collected data on 88 impact craters
- Craters ranged from 3km-50km in diameter
- Measured Lobateness: 'Γ', based on Nadine Barlow's (PhD, NAU) Equation $\Gamma = (\text{Ejecta Perimeter} / ((4\pi(\text{ejecta area}))^{1/2}))$
- Values for crater features, images were rendered and processed using USGS ISIS 3

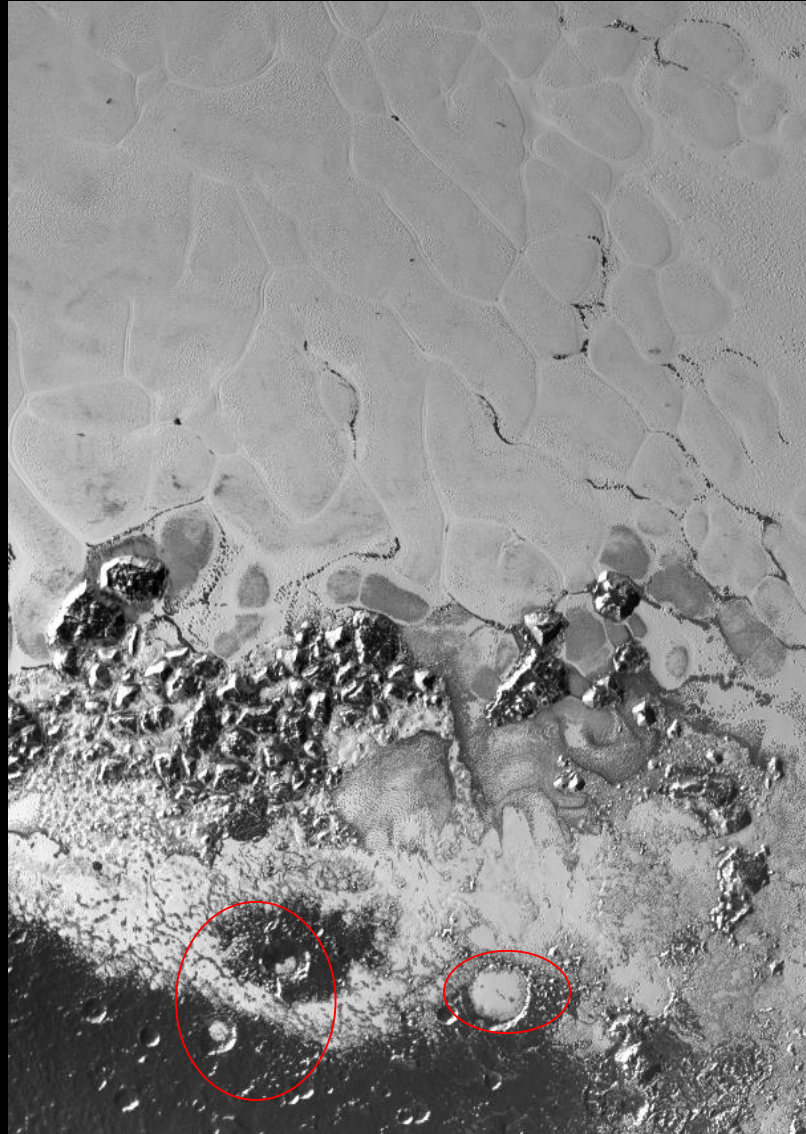


Conclusions

- Of the 88 craters studied:
 - 72 were Single Lobe (SL)
 - 14 were Dual Lobe (DL)
 - 2 were Multi Lobe (ML)
- Lobateness Values ranged from: 1.008-3.848
- Lobateness Values typically increased with proximity to NE Sputnik Planum (SP)
- Lobateness could be indicative of ease of vaporization of volatiles

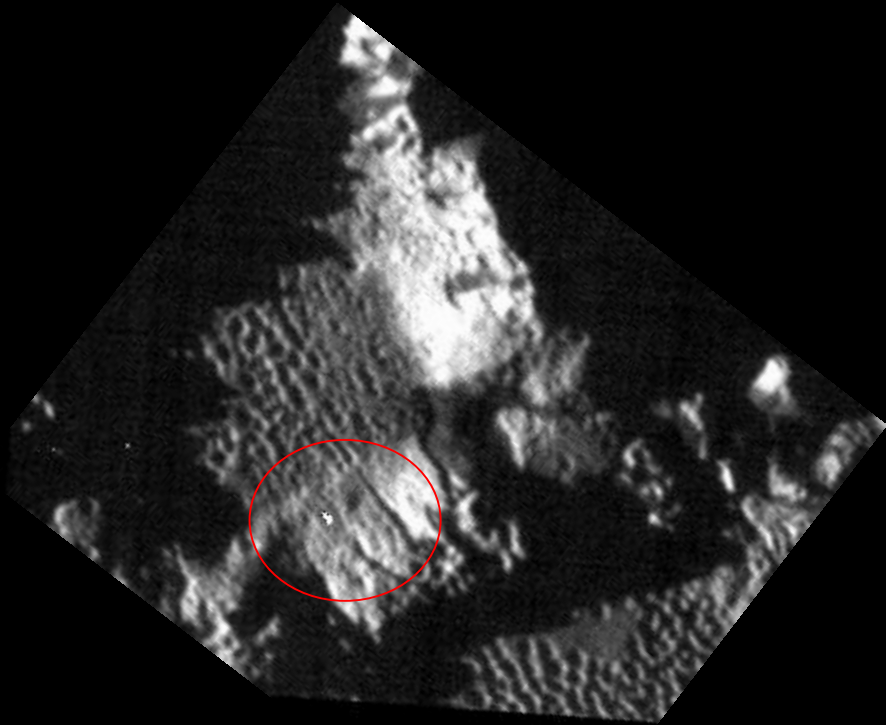


Sputnik Planum Border Craters



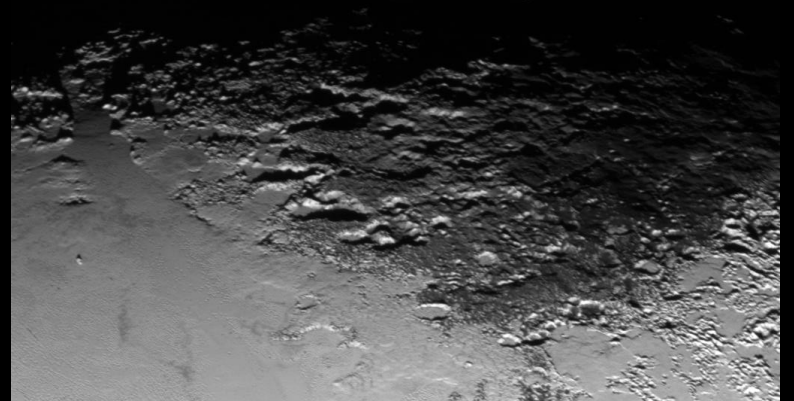
Search for Temporal Changes on Pluto and Charon

- Conducted analysis on 11GB of Flyby Data so far in search of short-term changes on the Surface of Pluto System bodies
- Took high resolution images of same terrain features at different points in time to search for activity *at the* time of the flyby
- Work is conducted between myself and Jason Hofgartner (PhD, JPL Postdoc)
- Required Image Registration and warping to study possible features in atmospheric haze
- Learned large amounts about proper image evaluation for NH Data
- Work is on going with multiple iterations



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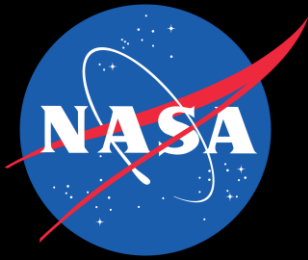
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Lessons Learned as an Intern

- Ask questions
- When in doubt, research the topic
- Go to talks, lectures, and workshops
- JPL is a world class collaborative organization
- Its 'OK' to not know something
- 167 Cafeteria does a mean Breakfast Burrito
- Explore lab whenever possible
- Try to meet new people everyday. They know something you do not.





Acknowledgements



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The Summer Interns of 3224!



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