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Characterizing the Activity of Manx Comets C2016 VZ18 and C2018 EF9

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Abstract

We will report on an investigation of the physical characteristics of Manx comets C/2016 VZ18 (PANSTARRS), and C2018 EF9 (PANSTARRS), to understand their origins, evolution, and roles in solar system growth. Manx comets are long period comets with little to no activity driven by sublimation. Characterizing Manxes comets' activity and composition allows us to assess the fraction of rocky inner solar system material that has been ejected to the Oort Cloud and is now migrating in to the inner solar system. This helps us distinguish between solar system formation models. We characterize each comet's physical properties and investigate potential ice sublimation using several methods including analysis of dust and coma dynamics with composite images, quantifying changes in photometry with sublimation and thermodynamic models, and calculating spectral reflectivity to determine surface material composition and likely asteroid class. Both C/2016 VZ18 and C/2016 EF9 are classified as long period comets from their orbits, however both were inactive at the time of discovery. Both had significant outbursts only when they were near 1 au that were quenched rapidly, becoming dormant in a few month's time. This suggests that the volatiles were at some depth beneath the surface. We thus consider these LPC's Manx candidates. We will present a thermal model of the activity of these two comets. We will report on the results of this analysis and discuss how it can be used to provide insight about the distribution of volatiles in the early solar system. This work is supported by NSF grants AST1413736 and AST1617015.

1. Introduction

C/2016 VZ18 and C2018 EF9 are minor bodies that are considered Manx candidates by our team. The Manx population consists of newly discovered small solar system bodies, discovered as a class in 2013 (Meech et al., 2016). Manxes are small bodies on long period comet orbits that show minimal or no cometary activity. The second Manx discovered, C/2014 S3 PANSTARRS, had an S-type spectral reflectivity, pointing towards a potential inner solar system origin. This discovery is significant because some solar system dynamical evolution models predict a that a fraction of inner solar system material should be present in the Oort Cloud due to gravitational disturbance during formation. Hence, scientific research on Manx comets may ultimately provide constraints on solar system formation models

We currently have many excellent dynamical and chemical models of the origin of our solar system. For the most part these are not coupled models. The models make significantly different predictions about how our solar system was assembled and how the ingredients necessary to form a habitable planet may have arrived in the inner solar system. To make progress in distinguishing between these models, we need additional constraints that can be used to validate the models. This work contributes to the model validation.

References

[1] Meech et al. Sci. Adv. 2016;2:e1600038