**A CLOSER LOOK AT GALILEO PHOTOPOLARIMETER-RADIOMETER (PPR) DATA FROM A POSSIBLE PLUME SOURCE NORTH OF PWYLL, EUROPA.** J. A. Rathbun[1], and J. R. Spencer[2], [1]Planetary Science Institute (1700 E. Fort Lowell, Tucson, AZ 85719 *rathbun@psi.edu*), [2]Southwest Research Institute (1050 Walnut Street, Suite 300, Boulder, CO 80302, USA).

**Introduction:** Two different observing techniques, both employing the Hubble Space Telescope, have found evidence for plumes just off Europa's limb [1-2]. More recent observations using the Jovian transit technique [3] determined that one location was the source of two separate detections: just north of the impact crater Pwyll at ~275 W, -16 S, a region we informally call North Pwyll. This source was detected on March 17, 2014 and February 22, 2016. Coinciding with this source is a broad thermal anomaly observed by the Galileo Photopolarimeter-Radiometer (PPR) during the Europan night [3-4]. [5] determined detection limits for the PPR observations and found that a 100 km$^2$ hotspot in the vicinity of North Pwyll would have been detected if it had a temperature above about 200 K.

[6] used PPR data to match a diurnal thermal model. They found N. Pwyll to have an albedo of ~0.5 and an abnormally high thermal inertia of ~140 in MKS units. [7] observed Europa using the Atacama Large Millimeter Array (ALMA). They found that the N. Pwyll region was cooler than its surroundings during the daytime. Using the best PPR nighttime observation and their ALMA observation, they fit a thermal model with an albedo of 0.59 and a thermal inertia of 140 MKS, consistent with [6].

**Additional PPR data:** In addition to the nighttime PPR observation of N. Pwyll [3-4] used by [7], there were 3 PPR observations obtained in min-morning, but they are noisier (temperature uncertainty of 7-9 K instead of ~2K in the nighttime observation). Those observations were used by [6] and here we combine all of the PPR observations of N. Pwyll with the ALMA observation.

**Thermal model fits:** We use the model of [8] that has been previously used by [5-6]. This model accounts for solar heating (which varies by observation), subsurface conduction and emitted radiation. We begin by assuming the emissivity of Europa's surface is the same across the spectrum. When we use an emissivity of 0.8, albedo of 0.59, and thermal inertia of 140 MKS (values used by [7]), we find that, while the diurnal curve matches the nighttime PPR point and the daytime ALMA point, it underestimates the mid-morning PPR observations.

An emissivity of 0.7 is able to better match the observations, but the resulting albedos (~0.45) are too low for the bright region surrounding Pwyll impact crater. We also made thermal model fits using different emissivities at PPR (~27.5 µm) and ALMA (1.3 mm) wavelengths. We set the PPR emissivity to either 0.9 or 1.0 and found the best match in each case. Our preferred model has emissivities of 0.9 at PPR wavelengths, which matches the Voyager value [9]. The best fit values for ALMA wavelength emissivity (0.8), albedo (0.54) and thermal inertia (133 MKS) are similar to the values in [6-7]. Reduced emissivities in the sub-mm have been reported for other bodies, such as KBOs [10].

**Discussion:** Fitting a simple surface thermal model to all these data may not be appropriate as they were obtained at wavelengths which may be probing to different depths. Additionally, at the size of the observation footprints (50-150 km in radius), the surface is unlikely to be uniform in surface temperature, so the different wavelengths will measure different brightness temperatures depending on the actual combination of surface temperatures within the field of view.

Temporal variability in surface properties also cannot be ruled out. A hotspot 200 K and 10 km in diameter could easily be hiding in each of the observations. Furthermore, such a hotspot, depending on formation mechanism, can cool dramatically in the 600 days between PPR observations and can completely disappear in the nearly 20 years between PPR and ALMA observations [11].

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