(163) Erigone, (302) Clarissa, and (752) Sulamitis as seen with JWST's NIRSpec

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Primitive asteroids in the Main Belt possess one of the most pristine inventories of materials in the Solar System. Main Belt primitive asteroids are particularly interesting due to clear evidence of phyllosilicates, i.e., silicates that have encountered liquid water and undergone chemical alteration. Since asteroids are thought to be likely contributors to Earth's water content [1-3], mapping hydration across the primitive asteroid population is essential for understanding the compositional structure of the early Solar System and the introduction of water on Earth. Low-albedo (pv < 10%) and low-inclination (i < 10°) primitive asteroid families in the inner Main Belt are dynamically linked to the primitive NEAs Ryugu and Bennu [4,5], further supporting the importance of investigating their composition and the dynamics responsible for their delivery to near-Earth space. The Cycle 3 Program, "Low-Albedo and Inclination Asteroid Families as Tracers for Water and Organics in the Inner Solar System," is currently conducting observations using the James Webb Space Telescope (JWST) to investigate this category of primitive bodies directly. Utilizing JWST's NIRSpec Integral Field Unit (IFU), the program is acquiring near-infrared spectra (0.6 – 5.2 µm) from the largest bodies in the Clarissa, Erigone, and Sulamitis asteroid families.

Initial investigations into the visible spectra of the Erigone, Sulamitis, and Clarissa families identified a specific trend regarding Fe-rich phyllosilicates: the Erigone and Sulamitis families exhibited similar, high percentages of members showing the 0.7 µm band, indicative of this mineral (60%). In contrast, an extremely low percentage of members expressed the feature in the Clarissa and Polana families [6]. While the absence of a 0.7 µm feature may initially suggest no hydration, it does not provide sufficient grounds to conclude that the body is not hydrated, as Mg-rich phyllosilicates do not show this feature. Studies have shown that although some asteroids lack the 0.7 µm feature, they may still exhibit the 3.0 µm region, whereas all asteroids with a 0.7 µm feature display the 3.0 µm band [7]. This region has been notoriously hard to observe from ground-based observatories due to the Earth's water-rich atmosphere. JWST observations are required to adequately constrain these bodies' thermal and compositional histories. We will present the compiled preliminary investigations of JWST NIRSpec spectra of (163) Erigone, (302) Clarissa, and (752) Sulamitis. We will search for diagnostic features of hydrated minerals, complex organics, and carbonates. Each spectral feature will be characterized by band center, depth, and area, and compared to features identified in the spectra of carbonaceous chondrite meteorite analogs to investigate possible relationships. Finally, we will explore the compositional diversity of inner belt primitive families and how this connects to their formation and evolutionary history.

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