Using Sun-grazing Comets to Probe the Solar Corona and Young Solar Wind: Observing Campaigns with PUNCH and Other Facilities

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Oral

Comets are among the most pristine bodies within the solar system and can give critical clues for its formation and the origin of life on Earth. Sun-grazing comets, those with perihelion distances of less than a few solar radii, are particularly valuable. The intense solar radiation during their close perihelion passages can evaporate thick layers of surface material and thus expose their otherwise invisible, pristine interiors. Their high-speed intrusion into the million-degree hot, magnetized solar corona and young solar wind make them natural probes to these regions, which are virtually inaccessible to man-made instruments. PUNCH, with its unique 3D imaging and large FOV coverage of 5-180 Rs can fill a critical gap for observing Sun-grazing comets. We review science highlights and lessons learned from Sun-grazing comet observing campaigns over the recent decades, and in particular of the most recent Comet C/2024 S1 (ATLAS) in October 2024. We discuss and solicit community inputs to the strategy to best utilize PUNCH's capabilities in future observing campaigns, involving a wide range of space-/ground-based, solar and cometary observing facilities.

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