

Planet-C: Observation Sequences and Onboard Data Processing

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Planet-C, or VCO (Venus Climate Orbiter) will carry 5 cameras (IR1: IR 1micrometer camera, IR2: IR 2micrometer camera, UVI: UV Imager, LIR: Long-IR camera, and LAC: Lightning and Airglow Camera) in the UV-IR region, to investigate atmospheric dynamics of Venus. During 30 hr orbiting designed to quasysynchronize to the super rotation of the Venus atmosphere (Fig.1), 3 groups of scientific observations will be carried out: (i) image acquisition (Fig.2) of 4 cameras (IR1, IR2, UVI, LIR) 20 min in 2 hrs, (ii) LAC operation only when VCO is within Venus shadow, and (iii) radio occultation. These observation sequences will define the scientific outputs of VCO program, but the sequences must be compromised with command & telemetry, downlink, and thermal/power conditions.

For maximizing science data downlink, it must be well compressed, and the compression efficiency and image quality have the significant scientific importance in the VCO program. Images of 4 cameras (IR1/2 and UVI 1Kx1K, and LIR 240x240) will be compressed using JPEG2000 (J2K) standard. J2K is selected because of a) no block noise, b) efficiency, c) both reversible and irreversible, d) patent/loyalty free, and e) already implemented as academic/commercial software, ICs, and ASIC logic designs. Data compression efficiencies of J2K are about 0.3 (reversible) and 0.1~0.01 (irreversible). The DE (Digital Electronics) unit, which controls 4 cameras and handles onboard data processing/compression, is under concept design stage. It is concluded that the J2K data compression logics/circuits using (space proven) ASIC is suitable (0.3W for 1M pixels in 3 sec, for 16 bit data) for the VCO program.

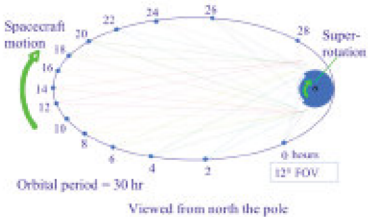


Fig. 1. VCO 30 hrs observations.

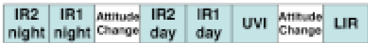


Fig. 2. Proposed sequence of 4 cameras (20 min). If Venus is >> 12° FOV, attitude changes between night and day side observations (or filter positions) will be preferable.