

NEXUS: the North ecliptic pole EXtragalactic Unified Survey

Thursday 21 November 2024 16:20 (20 minutes)

NEXUS is a JWST Multi-Cycle (Cycles 3–5; 368 primary hrs) GO Treasury imaging and spectroscopic survey around the North Ecliptic Pole. It contains two overlapping tiers. The Wide tier (~400 arcmin²) performs NIRCcam/WFSS 2.4–5 μ m grism spectroscopy with three epochs over 3 years (final continuum sensitivity of 22.2 at F444W). The Deep tier (~50 arcmin²) performs high-multiplexing NIRSpec 0.6–5.3 μ m MOS/PRISM spectroscopy for ~10,000 targets, over 18 epochs with a 2-month cadence (epoch/final continuum sensitivity of ~27/29 at 2 μ m). All epochs have simultaneous multi-band NIRCcam and MIRI imaging (5 σ final depths of ~28–29 in NIRCcam and ~25 in MIRI). The field is within the continuous viewing zone of JWST, and is fully covered by the Euclid Ultra-Deep Field, with 0.9–2 μ m deep Euclid spectroscopy and cadenced photometry to maximize synergy across wavelengths and science areas. NEXUS has three science pillars. First, with its massive and nearly complete (flux-limited) spectroscopic samples and deep photometry, it will perform efficient classification and physical characterization of galaxies and AGNs from $z \sim 1$ to Cosmic Dawn. With the large contiguous area coverage, it will measure the spatial clustering and demography of the first galaxies and SMBHs at $z > 6$. Second, multi-epoch observations enable systematic time-domain investigations, focusing on $z > 3$ transients and low-mass AGN reverberation mapping. Third, the comprehensive dataset will enable knowledge transfer to other legacy fields, create data challenges, and initiate benchmark work for future space missions. With rapid public releases of processed data and an open invitation for collaboration, NEXUS aims for broad and swift community engagement, to become a powerhouse to drive transformative advancements in multiple key science areas of astronomy.

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