will be roughly circular in shape. *JWST* GTO program 1176 will initially sample the NEP TDF during Cycle 1 at four distinct orientations ("spokes") with *JWST*/NIRCam, and take NIRISS slitless grism spectroscopy in parallel such that it overlaps the coverage of an alternate NIRCam orientation. This is the *only* region in the sky where *JWST* can observe a clean extragalactic deep survey field of this size at *arbitrary cadence* or at *arbitrary orientation*. This will crucially enable a wide range of new and exciting time-domain science, including high redshift transient searches and monitoring (e.g., SNe), variability studies from Active Galactic Nuclei to brown dwarf atmospheres, as well as proper motions of extreme scattered Kuiper Belt Objects and comets beyond the distance of Neptune, and of nearby Galactic brown dwarfs, low-mass stars, and ultracool white dwarfs. Ancillary data across the electromagnetic spectrum will exist for the NEP TDF and surrounding area when *JWST* science operations commence in 2021, ensuring a rich legacy of these UV–Visible *HST* observations. This includes deep X-ray observations; ground-based *UgrizYJHK* imaging, narrow-band spectrophotometry, and spectroscopy; (sub)mm observations; and both short- and long-wave radio observations.

Special Session 429 — Imaging the Shadow of Supermassive Black Hole with the Event Horizon Telescope

429.01 — Imaging the Shadow of Supermassive Black Hole with the Event Horizon Telescope

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In this talk, I will present the data processing and calibration tools developed especially to tackle the unique properties of Event Horizon Telescope (EHT) observations, the backbone of the 12 orders of magnitude in data reduction between raw recordings and the now-famous M87 black hole image. In addition to the difficulty of campaign coordination, acquisition and sheer volume of data, the heterogeneity of the EHT array and its susceptibility to weather and atmospheric turbulence at 1.3mm make the data calibration particularly challenging. The correlation stage, where the raw telescope data are combined and common signals are detected, is carried out at two central computing facilities. Three independent pipelines were developed to correct for instrumental and atmospheric delays in the arrival time of the signals at the telescopes, building on legacy EHT, low-frequency VLBI, and newly available processing software. Parallel calibration pipelines enabled an extensive suite of cross-validation tests to best quantify data quality and systematics. To disentangle intrinsic source signal from telescope behavior, detailed studies of telescope operations, sensitivities, and observing conditions were carried out. The final calibrated M87 data, ready for scientific analysis and imaging, exhibit clear indications of an asymmetric ring-like structure, with slight structural variations over the course of the observing campaign.

429.02 — Imaging the Shadow of Supermassive Black Hole with the Event Horizon Telescope

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In this talk, I will discuss the results of the numerical simulation work performed for the Event Horizon Telescope (EHT), both in relation to the model-constraining problem and as a way to understand the morphologies present in the reconstructed image. We have generated an extensive library of synthetic images, via ray tracing of general relativistic magnetohydrodynamic (GRMHD) simulations of black hole accretion flows, corresponding to a large set of physical and observational parameters. Through comparison of this library to the reconstructed image, we have determined that the EHT data are consistent with the image of the shadow of a spinning Kerr black hole as predicted by general relativity. Because many of the images are broadly consistent with the data, we also consider a jet power constraint. Only models of spinning black holes produce a large enough jet power, these via the Blandford-Znajek mechanism; therefore, we infer that the black hole has non-zero angular momentum. We identify the image asymmetry with the rotational orientation of the black hole and thus conclude that if the jet and and spin axis of the black hole are aligned as in our GRMHD models, then the spin vector of the black hole is directed away from us. Because the quantities that correspond to the broad image characteristics are not expected to vary greatly on human time scales, we predict the presence of similar features in subsequent observations.