Objective

- Demonstrate high-performance, long-wave infrared (LWIR, 10.3 – 12.5 µm) focal plane array (FPA) technology with significantly higher operating temperature and sensitivity than previously attainable, and with the flexibility to meet a variety of Earth science measurement needs, particularly those associated with small satellite missions. Targeted performance include:
  - Operating temperature: ≥ 80K
  - Quantum efficiency: 50%
  - Noise equivalent temperature: ≤ 25 mK
  - Demonstrate the use of meta-lens technology to raise the operating temperature of mid-wave IR (MWIR) FPAs from 150K to ~200K, and thus, significantly relax the cryocooling requirement for spaceborne operations.

Approach

- **JPL** will develop high quantum efficiency (QE), low dark current, very long wavelength infrared (VLWIR) detectors based on type-II superlattice (T2SL) barrier infrared detector (BIRD) technology for high operability/uniformity and low 1/f noise focal plane arrays.
- **GSFC** will apply the light-trapping meta-surfaced resonator pixel concept to ease the detector material demands and provide further QE enhancement.
- **Copious Imaging**’s high dynamic range digital readout integrated circuit (DROIC) with very large electron well capacity will be used for improving operating temperature and sensitivity.

Co-Is/Partners: David Ting, Thomas Pagano, JPL; Kwong-Kit Choi, GSFC; Christopher Masterjohn, Arvind D’Souza, DRS

Key Milestones

- Grow LWIR T2SL detector pathfinder material 06/18
- Fabricate pathfinder LWIR resonator BIRD FPA 10/18
- Complete LWIR (11 µm) resonator pixel (RP) design 10/18
- Fabricate pathfinder LWIR RP BIRD FPA 07/19
- Design MWIR meta-lens 12/19
- Procure DROIC wafer, test dewar, etc. 03/20
- Grow LWIR & MWIR T2SL material for DROIC FPAs 08/20
- Demonstrate single pixel meta-lens couple detectors 12/20
- Fabricate LWIR & MWIR DROIC FPAs 02/21
- Characterize LWIR & MWIR DROIC FPAs 04/21

**TRL_{in} = 2**  **TRL_{current} = 3**