PREPARED FOR

A NEW GENERATION INFRARED SKY SURVEY for the E-ELT era
(an assessment study)

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RATIONAL: A new era for optical/IR astronomy will begin by the end of this decade with JWST, LSST, EUCLID and 30/40 m class ground based telescopes such as the E-ELT. Giant instruments providing gains in sensitivity of several orders of magnitudes will require new large scale surveys (such as LSST) that will accompany their missions and key-programs to single out and follow-up new sources. Renewed canonical documents such as digitized catalogues and maps will be required. In the infrared range, projects are currently proposed to supersede 2MASS by a factor ~1000 in sensitivity and 3 in angular resolution, such as SASSI in the Northern Sky. We propose here a New Generation Infrared Sky Survey (NGISS) that could benefit from the Polar atmospheric conditions (e.g., at the French Italian Antarctic station Concordia) to optimize the performances and to extend the spectral coverage beyond 2.3 µm. The Antarctic Plateau offers very low sky brightness throughout the near- and mid-infrared range. A modest 2.5 telescope would have a sensitivity in K comparable to that of a 10 m ground-based telescope at Paranal. To fully benefit from the polar advantages, an off-axis concept is proposed.

Why a New Generation Infrared Sky Survey?

Preparing, accompanying and following-up ELT key-programs

• 2MASS not deep enough, NGISS should supersede VISTA (sky coverage, sensitivity, angular resolution, spectral range)
• NGISS coverage: 5 to 15 000 square degrees (Southern Sky)
• High sensitivity: gain ~ 1000 with respect to 2MASS at K
• High contrast: ~9 off-axis telescope proposed (see below)
• High angular resolution: 0.6" or better (thanks to site + GLAO)
• Extend spectral coverage beyond 2.3 µm (in particular the K and L windows), bridging ground/space surveys (WISE, Spitzer, ...)

Top Science drivers that will benefit from a NGISS

• Distant Universe
  • Early Universe: redshift galaxies, probing epoch of reionization; cosmic distance scale, Pop. III stars
  • Type Ia in dusty galaxies (survey and light curve follow-up)
• Extragalactic stellar populations
  • Synoptic time monitoring of Magellanic Stellar populations (extension of VMC: deeper ~2.3)
• Low mass stars, exoplanets and small bodies of the Solar System
  • Stellar: extreme brown dwarfs/floatng planets (field and SFR)
• Small bodies of the solar system (complementary to LSST)

Goals, deliverables, status

• Largest possible sky coverage at K_p < 25
• Provide new documents (catalogs, maps, data bases) matching the E-ELT requirements.
• Pipeline (LSST: CC/IRC)
• VO access compliance
• Explore time domain (like LSST)
• Follow-up transient sources discovered by explorer missions (e.g., EUCLID)
• Status: assessment study (ANR, HARVISON 2020)

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