AKARI OPEN TIME OBSERVING PROGRAMMES FOR PHASE-3-II

APPROVED PROPOSALS (EUROPEAN TIME)

Proposal: PLNTX

Title: Search for Planetary Mass Companions of Nearby Young Stars

PI: Carson, Joseph (Max-Planck-Institut fur Astronomie, Germany)

Abstract:

Within the last 15 years, the discovery of large numbers of gas-giant planets at narrow (like less than 1 AU) separations caused an upheaval in previously held views of planet formation and evolution. This fact reflects how observational planet-searches can revolutionize our notions of typical planet systems. Searches for planets in wide orbits (like more than a couple hundred AU) have a similar potential to generate watershed changes in our understanding of planet formation and evolution. Classical planet formation models (e.g. classical core accretion), generally used to explain moderate separation planets (akin to our own solar system objects), have difficulties accurately explaining wide-separation formation. The discovery of planets in wide orbits would indicate that additional mechanisms (like gravitational instability, planet-planet scattering, or outward migration) must play important roles. Knowledge of outer planets also enhances our understanding of the dynamics of Kuiper belts as well as the perturbing effects on inner planets. But despite this importance, little is known about the characteristics of planets at distances of 200 AU or more. To fill this gap, we propose to search, using AKARI IRC, for planetary mass companions around 4 young nearby stars. Thanks to the young ages (less than or equal 1Gyr) and limited distances (less than or equal 15 pc) of our targets, we will be sensitive to planets with mass as low as 4 MJ at 300 projected AU, and 2 MJ at 450 projected AU (for the mean target-sample distance and age). These observations will provide an exploration of planetary mass objects, or strong limits on their existence, in a currently unexplored region of extrasolar planetary systems.

Proposal: DBIR2

Title: Stellar populations and hot dust in debris of galaxy collisions.

PI: Duc, Pierre Alain (AIM, CEA-Saclay, France)

Abstract:

Debris of galaxy-galaxy collisions have recently proven to be particularly useful laboratories to address a variety of challenging questions, from the triggering of star formation to the distribution of dark matter in and around galaxies. Collisional debris expelled in the intergalactic space by tidal forces provide a peculiar, intergalactic-like, environment where stars may be formed in a different way than in disks, while sharing with them a similar interstellar medium. Comparing both modes of star formation (SF), one may learn about the role of large scale environmental effects on the SF process. In that aim, we have compiled the Spectral Energy Distributions (SED) of gas-rich collisional debris. One key wavelength domain is the near-infrared one where stellar emission (from UV to near-IR) and dust emission (from near-IR to mm) meet and mix. Uncertainties in the near-IR fluxes translate into large errors in the star formation history, and stellar masses, as reconstructed using evolutionary synthesis codes, while making any dust model elusive. Our Akari observations in the N2 band will provide photometric data points with the precision required to constrain our models. These data will allow us to estimate the fraction of old stars (expelled during the collision) vs young stars born in situ in gaseous tidal tails. From our numerical models, we expect some of our structures to be totally devoid of old stars. For such objects that experience their first starburst, we will be able to constrain their Initial Mass Function, in an environment where it had never been probed. Exploiting the IR side of our SED, we will confirm the existence of a possible near-IR excess in the star-forming debris which might be due to very hot dust. Finally, we will be able to obtain a precise measure of the total stellar mass, used in particular in the determination of the specific star formation. For some debris that proved to be gravitationally bound and for which we could determine a dynamical mass, we will compare it with the luminous mass (the sum of the gaseous and total stellar masses). Previous similar results revealed the existence of an unexpected missing mass in tidal debris and thus in the disk of their parent galaxies. This is a resubmission of a proposal which was allocated full time during phase 3-1 period, but for which some targets could not be scheduled.

Proposal: DISEL

Title: Deep NIR spectroscopy and imaging of Abell 2218

PI: Hopwood, Rosalind (The Open University, U.K.)

Abstract:

We propose near-infrared (NIR) mapping of the gravitational lensing cluster Abell 2218 (A2218, see figure 1), and deep spectroscopy to detect H-alpha emission lines for high redshift (z ~ 4) V band drop out galaxies situated behind the cluster. Our previous AKARI 15 micron observations of A2218, exploited the strong gravitational lensing of background sources by the cluster, and we used flux de-amplication and deblending of our source catalogue to probe beyond the AKARI blank field confusion limit. NIR mapping would likewise benefit from the lens magnifications of up to 10 times towards the cluster core, allowing the sampling of fainter populations not possible with blank field surveys. NIR emission is associated with the established stellar population of galaxies. With N2 - N4 observations we will estimate stellar masses using spectral energy distributions (SED) template fitting for sources up to redshifts of z = 4, thus tracing the star formation rate (SFR) as a function of mass. With this data we will be able to use AKARI MIR-NIR and NIR-NIR colour cuts to select dust obscured galaxies with extreme red MIR colours, which are analogous to Spitzer 24 micron selected Dust Obscured Galaxies (DOGs) and AKARI 11 micron selected Extremely Red MIR Objects (ERMOs). These galaxies have strong, or in rare cases dominant, AGN emission plus a starburst component. Interest in this galaxy population is high because they oer an evolutionary link between massive star forming galaxies and their local red and dead counterparts. The 2.5-5.0 micron wavelength range available for spectroscopy during phase 3 of the AKARI mission, offers a unique opportunity to identify H-alpha recombination lines for galaxies with redshifts of z>3, without rest-frame UV dust extinction suered by ground-based experiments. For AKARI spectroscopic observations we have selected two galaxies from our 15 micron selected catalogue, with photometric redshift estimates of z = 4. H-alpha emission line identification will provide confirmation of their redshifts, and SFR from H-alpha luminosity.

Proposal: DEPPO
Title: The chemistry of warm dust in early post-AGB stars
PI: Engels, Dieter (Hamburger Sternwarte, Germany)
Abstract:

We propose to use the AKARI warm phase for a study of the circumstellar envelope (CSE) emission of young post-AGB stars in the 1.8 – 5.5 micron wavelength range. We have used the AKARI and Spitzer satellite in the past to study stars, which are completely obscured in the optical and sometimes even in the near-infrared (lambda < 2 micron.) and which are thought to be in the process of terminating the AGB evolution or beginning the post-AGB phase. These stars are very bright at 10–40 micron and their emission comes from the CSE formed by the ongoing or recently terminated AGB mass loss. With the help of recent Spitzer photometry (GLIMPSE survey), we verified for quite a number of stars a near infrared excess in the spectral energy distribution. This excess is due to warm gas and dust illuminated by the remnant AGB core and which becomes visible now that the heavy AGB mass loss apparently has stopped. We propose to take near-infrared spectra to determine the chemistry of the material which is currently lost by the AGB core. This proposal continues our successful Phase 3-I proposal and requests observations for 22 new objects and 10 backup sources.

Proposal: UTIRC

Title: Spectroscopy of Ice Giants and Icy Moons

PI: Burgdorf, Martin (Deutsches SOFIA Institut, Germany)

Abstract:

We propose to study Uranus and Triton with the grism. The observations will address questions that can only be answered by AKARI, because the relevant spectral features are only poorly accessible from the ground or not at all:

- What is the abundance of the disequilibrium species carbon monoxide and phosphine on Uranus?
- Is there fluorescent emission from H3+ and methane on this planet?
- What is the spectral shape of the continuum flux density of Uranus and Triton in the near infrared?

These investigations will yield important information about the diffusion processes in the atmosphere and the electromagnetic environment of Uranus.

- What is the abundance of hydrogen cyanide on Triton?
- Which nitriles exist there?
- What differences exist between the leading and the trailing hemisphere of this moon?

HCN and nitriles are interesting as possible precursors to amino acids. The proposed observations will also produce spectra of Titania and Neptune, because these objects fall into the entrance aperture too.