ABSTACT BOOK

3rd Gaia Science Alerts Workshop

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Gaia status

The current status of Gaia is presented

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Gaia science alerts status and introduction to the verification phase

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Gaia Spectro Science Alerts: first implementation plans

Raw Radial Velocity Spectrometer (RVS) spectra (847-874 nm, R~11,500) will be transmitted from the Gaia satellite and processed within about one day by Gaia Data Processing and Analysis Consortium (DPAC) Co-ordination Unit (CU) 6 Daily Pipeline. RVS will observe, on average, 40 transits per object, which presents the opportunity for Spectro Science Alerts (SSA). Until SSA is ready to detect events using only RVS spectra, SSA can use Photometric Science Alerts (PSA) to flag the corresponding RVS spectra. Then by adapting PSA's AlertPipe Publisher to the CU6 Daily Pipeline, these RVS spectra and associated data products (radial velocity and Grvs magnitude) can also be published and linked to the original PSA. I will discuss these first SSA implementation plans and how PSA and SSA results from Gaia Science Alerts commissioning will help to decide whether there should be a link between PSA and SSA before publishing or not.

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Spectroscopic science alerts : possible triggers in the RVS domain

I will discuss about possible science alerts triggers, the reason why they deserve an alert, their characteristics in the RVS domain, and possible ways to identify them.

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Gaia-FUN-SSO: a network for Solar System transient objects

Some critical Solar System Objects will be observed by the Gaia mission: for example newly discovered asteroids or comets, NEOs such as new Potentially Hazardous Asteroids or Inner-Earth Asteroids, or asteroids with cometary activity. Owing to its scanning law, the satellite will generally allow only a poor monitoring of these objects (possibly no monitoring at all). A rather fast reaction for astrometric and photometric measurements will be necessary in particular to avoid the loss of the newly detected objects, to build or improve preliminary orbits and to monitor a brightness variability. For this goal, in relation with a specific task of the Gaia consortium (DU459-CU4), a dedicated ground-based network of observing stations has been set up: the Gaia-FUN-SSO network. We will give the recent information upon this development. authors: W. Thuillot, D. Bancelin, D. Hestroffer, B. Carry (IMCCE, Paris Observatory)

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Open Transient Science and Future Prospects with CRTS.

I will discuss the science and operation of Catalina Real-time Transient Survey (CRTS). I shall talk about how the incorporation of prior knowledge and data resource federation have been critical to understanding the nature of most transient sources. I shall discuss the data and classification challenges facing CRTS-II with expanding survey capabilities and changing observing strategies. Briefly, I will discuss the benefits and costs of open science.

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The Palomar Transient Factory, description and results

The Palomar Transient Factory (PTF) is a synoptic survey utilizing the 48" Schmidt camera on mount Palomar. The survey already observed over one million sq. degrees and discovered >5000 transients and about 1500 spectroscopically confirmed SNe. I will review the Palomar Transient Factory (PTF) and present some results from this project mainly in the context of GAIA capabilities.

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Global MASTER-Net

The main goals of the MASTER-Net project are to make prompt gamma-ray bursts optical observations and to produce an unique fast sky survey with all sky observed over a single night down to a limiting magnitude of 19 - 20mag. Such a survey will make it possible to address a number of fundamental problems: search for dark energy via the discovery and photometry of supernovas (including SNIa), search for exoplanets, microlensing effects, discovery of minor bodies in the Solar System and space-junk monitoring. All MASTER

telescopes can be guided by alerts, and we plan to observe prompt optical emission from gamma-ray bursts synchronously in several filters and in several polarization planes.

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4 Pi Sky of radio coverage: Transient discovery and response with next generation radio telescopes.

The forthcoming LOFAR, MeerKat and ASKAP facilities will soon be providing a huge increase in volume and sensitivity coverage for radio transient surveys. Accordingly we should expect the number of radio discovered targets of opportunity to match current levels of optically discovered ToOs. Phased array telescopes such as LOFAR will also make possible extremely rapid ToO followup and flexible multiple-target observing schemes. In this talk I will give a brief overview of the observatories 4 Pi Sky is collaborating with, discuss some of the transients we might expect to see in the radio, and hopefully provoke debate on how we can interface current transient classification programs with these new radio facilities.

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Multi-messenger and multi-wavelength follow-up of LOFAR discovered transients

Talk on the LOFAR survey for transients and the multi-wavelength and multi-messenger follow-up.

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Locating Transients with the e-EVN

The technique of electronic very long baseline interferometry (e-VLBI) provides means of rapid access to data from radio telescope arrays distributed over several 1000 km. At the European VLBI Network (EVN) regular e-VLBI mode operations have started (part of the observing time) in 2006. I will briefly review the e-EVN developments at JIVE and the transient science that can be done with real-time e-VLBI operations. Possible contributions to ongoing or future transient survey programmes and future mode of operations will be outlined as well.

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Overview talk of GW research and their connection with EM observations

An overview talk of GW research and their connection with EM observations.

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The TOROS project

I will report on a project to install a wide field telescope in Cordon Macón, in the Puna de Atacama region of the Northern Argentine province of Salta. I will present the characteristics of the site situated at 4,650 m of height, its seeing, wind profile and other environmental and geographical characteristics.The proposed observatory will be dedicated to search for transients in the Southern sky in general and to respond to Advanced LIGO triggers in particular. It is a collaboration of scientists from The University of Texas at Brownsville, the California Institute of Technology, Texas A&M University (all in the USA) , the Astronomical Observatory in Warsaw (Poland) and the Universidad Nacional de Córdoba (in Argentina).

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Automated Classification for the Palomar Transient Factory

We have developed machine-learning frameworks for transient discovery and classification for the Palomar Transient Factory (PTF). PTF detects 1.5M transient candidates per night using an image subtraction pipeline. Of those 1.5M candidates, only a handful are truly astrophysical transients, making it essential to use sophisticated algorithms to quickly separate the numerous image artifacts from the few astrophysical sources. I will discuss our development of the so-called Real-Bogus classifier for PTF transient discovery, which has allowed us to attain sub-6% missed detection rates at a 99% classification purity. I will also describe our efforts to leverage the input of citizen scientist crowdsourcing projects to construct an automated transient classifier. These machine-learning frameworks hold great promise for upcoming surveys, where fast discovery is essential for timely follow-up of interesting transients.

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Using field information to separate SNe and non-SNe

When a new transient is found a variety of background information can be used to determine if it is likely to be a supernova. While this is easy when a relatively bright galaxy is nearby, more factors need to be considered for fainter galaxies, and for potential dwarf galaxies. We describe the use of cone-searches from archives and use of other priors to make such a decision as best as can be made. This should facilitate early follow-up for deserving candidates and an important step in multi-species classification.

Lukasz Wyrzykowski
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Classification of transients with Gaia satellite

I will present current status of the development of classification approaches to the transients found in Gaia. We plan to exploit all available Gaia data in order to classify transients, including light curve and low-resolution spectra.

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Analysis of outlying observations from Gaia CU8 classification pipeline

Gaia will manage a set of standardized classification labels that were simplified as much as possible in view of the enormous amount of observations that will take place: Star, Quasar, Physical Binaries, Non-Physical Binaries, Galaxy, and Solar System Objects. The expectation of the Gaia DPAC is that these labels will enable the supervised classification tools that are developed in the course of the Gaia project to classify approximately 95% of the observed sources. Outliers will eventually be all the objects that cannot be related with a certain degree of probability to one of the predefined categories, either because their observations are complex or because they belong to a new class of objects that is rarely found in our Galaxy. The purpose of the Outlier Analysis (OA) workpackage of Gaia DPAC team is to prepare algorithms for analyzing the physical nature of all the objects that are observed but cannot be identified as members of a known class of astronomical objects. Gaia outliers' analysis has been approached by means of non-supervised neural networks and clustering algorithms. The software performs a segmentation of all outliers by different clustering techniques, using both statistical and Artificial Intelligence methodologies. OA groups outliers in a limited number of clusters using unsupervised clustering techniques. Those clusters populated with objects with an unknown or complex nature will be subjected to further analysis including cross-identification with external catalogs and subjected to complementary observations.

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Responding to the Event Deluge with VOEventNet

We present the VOEventNet infrastructure for large-scale rapid follow-up of astronomical events, including selection, annotation, machine intelligence, and coordination of observations. The VOEvent standard is central to this vision, with distributed and replicated services rather than centralized facilities. We also describe some of the event brokers, services, and software that are connected to the network. These technologies will become more important in the coming years, with new event streams from Gaia, LOFAR, LIGO, LSST, and many others.

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Cambridge Photometric Follow-up Calibration Server, report from tests and verification phase arrangements

The main purpose of the Calibration Server installed in Cambridge is to assure homogeneity of the follow-up observations of transient events detected by Gaia and other surveys. We will present the features of this tool and some first results of the observing campaigns. Giuseppe Altavilla will present the results from Italian tests performed in 2011.

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The 1.8m telescope at Cima Ekar and SN classification programme at Asiago

We intend to present the new operating model of the 1.8m telescope at Cima Ekar. In the last 6 months the telescope ha classified over 100 new SNe in addition to spectral time series of a number of selected objects. This experience can in principle be exported to other small size telescopes around the world.

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RTS2: advances in last two years

I would like to present RTS2 - remote telescope system, 2nd version - and experience we gained operating world-wide network of fully autonomous observatories.

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Observational facilities at INAF OA-Catania

Catania Astrophysical Observatory can contribute to the follow up of GAIA alerts with the 80 cm robotic telescope. We give a short description of facilities at Catania Observatory and in particular of the robotic telescope that will be used to answer alert calls. Authors: Leto, G., Pagano I., Sanchez Zanmar, R. et al.

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The Observing Facilities of the Vienna Observatory

The Vienna Observatory has presently a 1.5m and a 0.8m optical telescope in operation. The 1.5m telescope has been recently upgraded to a remote control facility. An overview

will be given on the available instrumentation and observing conditions. Results from recent tests in preparation for the Gaia Ground Based Optical Tracking project will be presented. A summary of the research interests for Gaia follow-up and monitoring observations will be given.

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The PIRATE facility

I will give an overview of the PIRATE facility and its current research programme. I will also show how the research output of PIRATE benefits from Open University undergraduate students trained on PIRATE.

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Synergy of GAIA mission with the Devasthal Optical Telescopes for follow-up observations

Devasthal (79E,29N), in western Himalayan region of India is getting several optical telescopes of 1 to 4 meter classes. The first telescope of 130-cm aperture, a F/4 wide field telescope is operational since 2011. The 360-cm telescope will be installed at Devasthal by early 2013. The first instrument on this telescope will be a Faint object spectrograph camera capable of detecting sources down to 24.5 magnitude in imaging and 19 magnitude in low resolution spectroscopy. The other instruments being designed and developed for the 360-cm telescope are near infrared imager, High resolution Echelle spectrograph, and a fibre based integral field unit. Our group is involved in the study of many interesting objects such as variable stars, GRBs, Exoplanets, supernovae, X-ray binaries and AGNs using 1-meter and 1.3 meter telescopes of the institute. The high detection sensitivity and fast imaging is crucial for follow up of several transients sources and our telescopes will compliment the observations of sources detected by GAIA. The status of the telescope and plans to synergize the GAIA alerts will also be presented.