Analysis of the GRAV-D airborne gravity data for geoid modelling

In this study, airborne gravity data from the Gravity for the Redefinition of the American Vertical Datum (GRAV-D) project are compared with terrestrial gravity data in three survey blocks that cross the Canada-US border. One block (AN04) overlaps an area containing Alaska (USA) and the Yukon Territory (Canada) over a rough terrain while the other two blocks (EN05 and EN08) are within the Great Lakes-St-Lawrence River region with flat and moderate terrains. GRAV-D has an average flight altitude of about 6 km in the three blocks, in which each survey/cross line spans 240–700 km. The high flight altitude of GRAV-D puts forth a challenge for the comparisons. We have developed procedures to interpolate and continue the airborne and terrestrial gravity data to a mean flight height for each block. The remove-compute-restore Poisson method is used in the upward continuation of the terrestrial gravity data by removing and restoring the satellite-only geopotential model GOCO05S. The comparison between the datasets is done using Helmert gravity disturbances in order to satisfy the harmonic condition of the upward continuation. The comparisons show that differences between GRAV-D and terrestrial gravity data are 3.6 mGal for AN04, 1.8 mGal for EN05 and 2.3 mGal for EN08 in terms of Root Mean Square (RMS) at the mean flight height. The results can be improved for two blocks when applying a cross-over adjustment. The differences become 1.0 and 1.4 for EN05 and EN08, respectively.

Cold gas in the early Universe - Survey for neutral atomic-carbon in GRB host galaxies at 1 < z< 6 from optical afterglow spectroscopy

We present a survey for neutral atomic-carbon (CI) along gamma-ray burst (GRB) sightlines, which probes the shielded neutral gas-phase in the interstellar medium (ISM) of GRB host galaxies at high redshift. We compile a sample of 29 medium- to high-resolution GRB optical afterglow spectra spanning a redshift range through most of cosmic time from 1 < z < 6. We find that seven (≈25%) of the GRBs entering our statistical sample have CI detected in absorption. It is evident that there is a strong excess of cold gas in GRB hosts compared to absorbers in quasar sightlines. We investigate the dust properties of the GRB CI absorbers and find that the amount of neutral carbon is positively correlated with the visual extinction, AV, and the strength of the 2175 Å dust extinction feature, Abump. GRBs with CI detected in absorption are all observed above a certain threshold of logN(HI)/cm$^{-2}$ + [X/H] > 20.7 and a dust-phase iron column density of logN(Fe)$_{dust}$/cm$^{-2}$ > 16.2. In contrast to the SED-derived dust properties, the strength of the CI absorption does not correlate with the depletion-derived dust properties. This indicates that the GRB CI absorbers trace dusty systems where the dust composition is dominated by carbon-rich dust grains. The observed higher metal and dust column densities of the GRB CI absorbers compared to H2- and CI-bearing quasar absorbers is mainly a consequence of how the two absorber populations are selected, but is also required in the presence of intense UV radiation fields in actively star-forming galaxies.
Dense matter with eXTP

In this White Paper we present the potential of the Enhanced X-ray Timing and Polarimetry (eXTP) mission for determining the nature of dense matter; neutron star cores host an extreme density regime which cannot be replicated in a terrestrial laboratory. The tightest statistical constraints on the dense matter equation of state will come from pulse profile modelling of accretion-powered pulsars, burst oscillation sources, and rotation-powered pulsars. Additional constraints will derive from spin measurements, burst spectra, and properties of the accretion flows in the vicinity of the neutron star.

Under development by an international Consortium led by the Institute of High Energy Physics of the Chinese Academy of Sciences, the eXTP mission is expected to be launched in the mid 2020s.

General information

State: Published
Organisations: National Space Institute, Astrophysics and Atmospheric Physics, University of Amsterdam, Shanghai Astronomical Observatory Chinese Academy of Sciences, University of Turku, Chinese Academy of Sciences, Tata Institute of Fundamental Research, Columbia University, University of Tübingen, Leiden University, Silesian University in Opava, Middle East Technical University (METU), Osservatorio Astronomico Roma, University of Pisa, Michigan State University, Princeton University, University of Palermo, University of East Anglia, National Institute for Astrophysics, Pontificia Universidad Catolica de Chile, Clemson University, Monash University, SRON Netherlands Institute for Space Research, George Washington University, University of Stavanger, Xiamen University, Nanjing University, XiangTan University, Polytechnic University of Catalonia, NASA Goddard Space Flight Center, University of Groningen, University of Alberta, Massachusetts Institute of Technology, International Space Science Institute, Hubei University of Education, Technische Universität Darmstadt, University of Maryland, Technische Universität Darmstadt
Number of pages: 17
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Science China: Physics, Mechanics and Astronomy
Volume: 62
Issue number: 2
Article number: 29503
ISSN (Print): 1674-7348
Ratings:
Ice dynamics of union glacier from SAR offset tracking

The Antarctic ice sheet is predicted to be the major contributor to sea-level rise during the XXI century. Therefore, monitoring ice dynamics of outlet glaciers in Antarctica is of great importance to assess future sea-level rise predictions. Union Glacier is one of the major outlet glaciers of the Ellsworth Mountains and drains into the Ronne-Filchner Ice Shelf. Glaciers can be studied using remote-sensing techniques, which combined with field measurements can deliver a good approximation of its dynamics and can be used as input for glacier models. In this study we acquired high resolution Stripmap HIMAGE SAR images from the COSMO-SkyMed satellite constellation during austral summer of 2011–2012, and applied a SAR offset tracking algorithm to compute ice velocities. Then, we compared our derived velocities with field data already published. Results showed mean values of ice velocity estimated for the main trunk of the glacier are 0.043 (0.0393 SD) m d\(^{-1}\), with values reaching up to 0.325 m d\(^{-1}\), in agreement with previous studies. A model of ice thickness based on lamellar flow theory is proposed, using estimated surface ice velocity in combination with surface slope derived from TanDEM-X as input data. Comparison of our modeled ice thickness with radar data agree with a mean absolute deviation of 19.22%. From surface ice velocities we computed principal strain rates in order to assess crevasse formation and closure. Thereafter, using high resolution COSMO-SkyMed Spotlight-2 SAR images we establish a relation between surface features and acting strain components.

General information
Influence of local geoid variation on water surface elevation estimates derived from multi-mission altimetry for Lake Namco

Water surface elevation (WSE) is an essential quantity for water resource monitoring and hydrodynamic modeling. Satellite altimetry has provided data for inland water bodies. The height that is derived from altimetry measurement is ellipsoidal height. In order to convert the ellipsoidal height to orthometric height, which has physical meaning, accurate estimates of the geoid are needed. This paper evaluates the suitability of geodetic altimetric measurements for improvement of global geoid models over a large lake in the Tibetan Plateau. CryoSat-2 and SARAL/AltiKa are used to derive the high-frequency geoid correction. A validation of the local geoid correction is performed with data from in-situ observations, a laser altimetry satellite (ICESat), a Ka-band radar altimetry satellite (SARAL) and a SAR radar altimetry satellite (Sentinel-3). Results indicate that the geodetic altimetric dataset can capture the high-resolution geoid information. By applying local geoid correction, the precision of ICESat, SARAL and Sentinel-3 retrievals are significantly improved. We conclude that using geodetic altimetry to correct for local geoid residual over large lakes significantly decreases the uncertainty of WSE estimates. These results also indicate the potential of geodetic altimetry missions to determine local geoid residual with centimeter-level accuracy, which can be used to improve global and regional geopotential models.

General information
State: Published
Organisations: Department of Environmental Engineering, Air, Land & Water Resources, National Space Institute, Geodesy, Chinese Academy of Sciences
Contributors: Jiang, L., Andersen, O. B., Nielsen, K., Zhang, G., Bauer-Gottwein, P.
Pages: 65-79
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Remote Sensing of Environment
Volume: 221
ISSN (Print): 0034-4257
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 7.16 SJR 3.121 SNIP 2.5
Web of Science (2017): Impact factor 6.457
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 6.92 SJR 3.035 SNIP 2.956
Web of Science (2016): Impact factor 6.265
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 7.27 SJR 3.697 SNIP 3.044
Web of Science (2015): Impact factor 5.881
Innovative Multi-Feed-Per-Beam Reflector Antenna for Space-Borne Conical-Scan Radiometers

We present an antenna for use on conical-scan space-borne radiometers in C band and demonstrate that stringent radiometric requirements can be met. The antenna consists of as m offset reflector fed by a focal plane array in a multi-feed-per-beam configuration, so far never used in ocean observation missions. We use distinct element beams and two optimization routines for obtaining element excitation amplitudes and phases, and with either routine, and in both x- and y-polarization, compliant beams, with footprint < 20 km, distance to coast < 20 km and accuracy < 0.25 K, are obtained. These results may pave the way for use of focal plane arrays with digital beamforming in future radiometric ocean observation missions.

General information
State: Published
Organisations: National Space Institute, Microwaves and Remote Sensing, Technical University of Denmark, Chalmers University of Technology, TICRA, European Space Agency - ESA
Contributors: de Lasson, J. R., Cappelin, C., Pontoppidan, K., Iupikov, O., Ivashina, M., Skou, N., Fiorelli, B.
Pages: 1729-1730
Publication date: 2019

Host publication information
Title of host publication: 2018 IEEE International Symposium on Antennas and Propagation and Usnc/ursi National Radio Science Meeting
Publisher: IEEE
ISBN (Electronic): 978-1-5386-7102-3
Keywords: Antenna arrays, Radiometers, Oceans, Optimization, Microwave radiometry, Sea measurements
Electronic versions:
Innovative_multi_feed_per_beam_reflector_antenna_for_space_borne_conical_scan_radiometers.pdf
DOIs: 10.1109/APUSNCURSINRSM.2018.8609321
Source: FindIt
Source-ID: 2443043029
Research output: Research - peer-review ; Article in proceedings – Annual report year: 2019

K2-140b and K2-180b – Characterization of a hot Jupiter and a mini-Neptune from the K2 mission

We report the independent discovery and characterization of two K2 planets: K2-180b, a mini-Neptune-sized planet in an 8.9-d orbit transiting a V=12.6 mag, metal-poor ([Fe/H] = −0.65 ± 0.10) K2V star in K2 campaign 5; K2-140b, a transiting hot Jupiter in a 6.6-d orbit around a V=12.6 mag G6V ([Fe/H] = +0.10 ± 0.10) star in K2 campaign 10. Our results are based on K2 time-series photometry combined with high-spatial resolution imaging and high-precision radial velocity measurements. We present the first mass measurement of K2-180b. K2-180b has a mass of Mp = 11.3 ± 1.9 M⊕ and a radius of Rp = 2.2 ± 0.1 R⊕, yielding a mean density of ρp = 5.6 ± 1.9 g cm−3, suggesting a rocky composition. Given its radius, K2-180b is above the region of the so-called ‘planetary radius gap’. K2-180b is in addition not only one of the densest mini-Neptune-sized planets, but also one of the few mini-Neptune-sized planets known to transit a metal-poor star. We also constrain the planetary and orbital parameters of K2-140b and show that, given the currently available Doppler measurements, the eccentricity is consistent with zero, contrary to the results of a previous study.

General information
State: Published
Organisations: Astrophysics and Atmospheric Physics, National Space Institute, Universität zu Köln, German Aerospace Center, University of Turin, Chalmers University of Technology, Leiden University, Tokyo Institute of Technology, University of Tokyo, University of La Laguna, Aarhus University, University of Texas at Austin, Princeton University, Wesleyan University, Thüringer Landessternwarte Tautenburg, National Institute for Astrophysics, National Astronomical Observatory of Japan, University of Groningen
Pages: 1807-1823
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Monthly Notices of the Royal Astronomical Society
Volume: 482
Issue number: 2
ISSN (Print): 0035-8711
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.54 SJR 2.346 SNIP 0.904
Web of Science (2017): Impact factor 5.194
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 4.09 SJR 2.388 SNIP 1.134
Web of Science (2016): Impact factor 4.961
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 4 SJR 2.701 SNIP 1.165
Web of Science (2015): Impact factor 4.952
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.79 SJR 3.23 SNIP 1.322
Web of Science (2014): Impact factor 5.107
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 5.1 SJR 3.155 SNIP 1.23
Web of Science (2013): Impact factor 5.226
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 4.89 SJR 3.283 SNIP 1.392
Web of Science (2012): Impact factor 5.521
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 4.63 SJR 2.964 SNIP 1.35
Web of Science (2011): Impact factor 4.9
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 3.18 SNIP 1.339
Web of Science (2010): Impact factor 4.888
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 3.662 SNIP 1.512
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 3.6 SNIP 1.287
Scopus rating (2007): SJR 3.399 SNIP 1.287
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 4.769 SNIP 1.326
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 4.434 SNIP 1.229
Scopus rating (2004): SJR 4.385 SNIP 1.384
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 3.104 SNIP 1.35
Scopus rating (2002): SJR 2.491 SNIP 1.325
Scopus rating (2001): SJR 2.251 SNIP 1.042
Observatory science with eXTP

In this White Paper we present the potential of the enhanced X-ray Timing and Polarimetry (eXTP) mission for studies related to Observatory Science targets. These include flaring stars, supernova remnants, accreting white dwarfs, low and high mass X-ray binaries, radio quiet and radio loud active galactic nuclei, tidal disruption events, and gamma-ray bursts. eXTP will be excellently suited to study one common aspect of these objects: their often transient nature. Developed by an international Consortium led by the Institute of High Energy Physics of the Chinese Academy of Science, the eXTP mission is expected to be launched in the mid 2020s.

General information

State: Published
Organisations: National Space Institute, Astrophysics and Atmospheric Physics

Number of pages: 42
Publication date: 2019
Peer-reviewed: Yes

Publication information

Journal: Science China Physics, Mechanics and Astronomy
Volume: 62
Issue number: 2
Article number: 29506
ISSN (Print): 1674-7348
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
Photodynamical analysis of the triply eclipsing hierarchical triple system EPIC 249432662

Using Campaign 15 data from the K2 mission, we have discovered a triply-eclipsing triple star system: EPIC 249432662. The inner eclipsing binary system has a period of 8.23 days, with shallow ∼3% eclipses. During the entire 80-day campaign, there is also a single eclipse event of a third-body in the system that reaches a depth of nearly 50% and has a total duration of 1.7 days, longer than for any previously known third-body eclipse involving unevolved stars. The binary eclipses exhibit clear eclipse timing variations. A combination of photodynamical modeling of the lightcurve, as well as seven follow-up radial velocity measurements, has led to a prediction of the subsequent eclipses of the third star with a period of 188 days. A campaign of follow-up ground-based photometry was able to capture the subsequent pair of third-body events as well as two further 8-day eclipses. A combined photo-spectro-dynamical analysis then leads to the determination of many of the system parameters. The 8-day binary consists of a pair of M stars, while most of the system light is from a K star around which the pair of M stars orbits.

General information

State: Published
Organisations: National Space Institute, University of California at Berkeley, Hungarian Academy of Sciences, Massachusetts Institute of Technology, Raemor Vista Observatory, Harvard-Smithsonian Center for Astrophysics, California Institute of Technology, Perth Exoplanet Survey Telescope, NASA Goddard Space Flight Center, Ruhr-Universität Bochum, University of Texas at Austin
Pages: 1934–1951
Publication date: 2019
The Eclipsing δ Scuti Star EPIC 245932119

We present the physical properties of EPIC 245932119 (Kp = +9.82) exhibiting both eclipses and pulsations from the K2 photometry. The binary modeling indicates that the eclipsing system is in detached or semi-detached configurations with a mass ratio of 0.283 or 0.245, respectively, and that its light-curve parameters are almost unaffected by pulsations. Multiple frequency analyses were performed for the light residuals in the outside-primary eclipsing phase after subtracting the binarity effects from the observed data. We detected 35 frequencies with signal-to-noise amplitude ratios larger than 4.0 in two regions of 0.62-6.28 day^{-1} and 19.36-24.07 day^{-1}. Among these, it is possible that some high signals close to the Nyquist limit f(Ny) may be reflections of real pulsation frequencies (2f_{Ny} - f_i). All frequencies (f_8, f_9, f_{14}, f_{18}, f_{24}, f_{32}) in the lower frequency region are orbital harmonics, and three high frequencies (f_{19}, f_{20}, f_{22}) appear to be sidelobes split from the main frequency of f_i = 22.77503 day^{-1}. Most of them are thought to be alias effects caused by the orbital frequency. For the 26 other frequencies, the pulsation periods and pulsation constants are in the ranges of 0.041-0.052 days and 0.013-0.016 days, respectively. These values and the position in the Hertzsprung-Russell diagram reveal that the primary component is a delta Sct pulsator. The observational properties of EPIC 245932119 are in good agreement with those for eclipsing binaries with delta Sct-type pulsating components.

General information
State: Published
Organisations: National Space Institute, Korea University of Science and Technology, Chungbuk National University
Contributors: Lee, J. W., Hong, K., Kristiansen, M. H.
Number of pages: 8
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Astrophysical Journal
Volume: 157
Issue number: 1
ISSN (Print): 0004-637X
Ratings:
BFI (2019): BFI-level 2
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 4.41
Time-predictable synchronization support with a shared scratchpad memory

Multicore processors need to communicate when working on shared tasks. In classical systems, this is performed via shared objects protected by locks, which are implemented with atomic operations on the main memory. However, access to shared main memory is already a bottleneck for multicore processors. Furthermore, the access time to a shared
memory is often hard to predict and therefore problematic for real-time systems. This paper presents a shared on-chip memory that is used for communication and supports atomic operations to implement locks. Access to the shared memory is arbitrated with time division multiplexing, providing time-predictable access. The shared memory supports extended time slots so that a processor can execute more than one memory operation atomically. This allows for the implementation of locking and other synchronization primitives. We evaluate this shared scratchpad memory with synchronization support on a 9-core version of the T-CREST multicore platform. Worst-case access latency to the shared scratchpad is 13 clock cycles. Access to the atomic section under full contention, when every processor core wants access to acquire a lock, is 135 clock cycles.

**General information**

State: Published
Organisations: Department of Photonics Engineering, National Space Institute, Coding and Visual Communication, Department of Applied Mathematics and Computer Science, Embedded Systems Engineering, Technical University of Denmark
Contributors: Maroun, E. J., Hansen, H. E., Kristensen, A. T., Schoeberl, M.
Pages: 34-42
Publication date: 2019
Peer-reviewed: Yes

**Publication information**

Journal: Microprocessors and Microsystems
Volume: 64
ISSN (Print): 0141-9331
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.19 SJR 0.24 SNIP 0.771
Web of Science (2017): Impact factor 1.049
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.11 SJR 0.225 SNIP 0.822
Web of Science (2016): Impact factor 1.025
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 0.89 SJR 0.25 SNIP 0.857
Web of Science (2015): Impact factor 0.471
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 1
Scopus rating (2014): CiteScore 0.97 SJR 0.236 SNIP 1.057
Web of Science (2014): Impact factor 0.43
BFI (2013): BFI-level 1
Scopus rating (2013): CiteScore 1.02 SJR 0.225 SNIP 1.182
Web of Science (2013): Impact factor 0.598
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 1
Scopus rating (2012): CiteScore 0.94 SJR 0.214 SNIP 0.729
Web of Science (2012): Impact factor 0.549
ISI indexed (2012): ISI indexed yes
BFI (2011): BFI-level 1
Scopus rating (2011): CiteScore 0.99 SJR 0.214 SNIP 0.797
Web of Science (2011): Impact factor 0.575
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 1
Version 2 of the EUMETSAT OSI SAF and ESA CCI sea-ice concentration climate data records

We introduce the OSI-450, the SICCI-25km and the SICCI-50km climate data records of gridded global sea-ice concentration. These three records are derived from passive microwave satellite data and offer three distinct advantages compared to existing records: first, all three records provide quantitative information on uncertainty and possibly applied filtering at every grid point and every time step. Second, they are based on dynamic tiepoints, which capture the time evolution of surface characteristics of the ice cover and accommodate potential calibration differences between satellite emissions. Third, they are produced in the context of sustained services offering committed extension, documentation, traceability, and user support. The three records differ in the underlying satellite data (SMMR & SSM/I & SSMIS or AMSR-E & AMSR2), in the imaging frequency channels (37 GHz and either 6 or 19 GHz), in their horizontal resolution (25 or 50 km), and in the time period they cover. We introduce the underlying algorithms and provide an evaluation. We find that all three records compare well with independent estimates of sea-ice concentration both in regions with very high sea-ice concentration and in regions with very low sea-ice concentration. We hence trust that these records will prove helpful for a better understanding of the evolution of the Earth's sea-ice cover.

General information
State: Published
Organisations: National Space Institute, Microwaves and Remote Sensing, Norwegian Meteorological Institute, University of Hamburg, Danish Meteorological Institute, Max Planck Institute for Meteorology, Barcelona Expert Center on Remote Sensing, University of Bremen, Nansen Environmental and Remote Sensing Center
Pages: 49-78
Publication date: 2019
Peer-reviewed: Yes

Publication information
Journal: Cryosphere
Volume: 13
Issue number: 1
ISSN (Print): 1994-0416
Ratings:
BFI (2019): BFI-level 1
Web of Science (2019): Indexed yes
BFI (2018): BFI-level 1
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 4.84 SJR 3.034 SNIP 1.425
Web of Science (2017): Impact factor 4.524