Accelerating changes in ice mass within Greenland, and the ice sheet's sensitivity to atmospheric forcing

From early 2003 to mid-2013, the total mass of ice in Greenland declined at a progressively increasing rate. In mid-2013, an abrupt reversal occurred, and very little net ice loss occurred in the next 12-18 months. Gravity Recovery and Climate Experiment (GRACE) and global positioning system (GPS) observations reveal that the spatial patterns of the sustained acceleration and the abrupt deceleration in mass loss are similar. The strongest accelerations tracked the phase of the North Atlantic Oscillation (NAO). The negative phase of the NAO enhances summertime warming and insolation while reducing snowfall, especially in west Greenland, driving surface mass balance (SMB) more negative, as illustrated using the regional climate model MAR. The spatial pattern of accelerating mass changes reflects the geography of NAO-driven shifts in atmospheric forcing and the ice sheet's sensitivity to that forcing. We infer that southwest Greenland will become a major future contributor to sea level rise.

General information
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Web of Science (2018): Indexed yes
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Scopus rating (2017): CiteScore 8.59 SJR 6.092 SNIP 2.626
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 8.56 SJR 6.576 SNIP 2.642
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 8.84 SJR 6.814 SNIP 2.691
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 8.86 SJR 6.898 SNIP 2.734
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Scopus rating (2013): CiteScore 9.5 SJR 7.073 SNIP 2.738
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BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 9.31 SJR 6.864 SNIP 2.646
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 6.898 SNIP 2.545
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.

General information
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Organisations: Geodynamics, National Space Institute, Natural Resources Canada, Stinger Ghaffarian Technologies
Pages: 61-77
Publication date: 2019
Broad Absorption Line Disappearance/Emergence in Multiple Ions in a Weak Emission-line Quasar

We report the discovery of the disappearance of Mg ii, Al iii, C iv, and Si iv broad absorption lines (BALs) at the same velocity (0.07c), accompanied by a new C iv BAL emerging at a higher velocity (up to 0.11c), in the quasar J0827+4252 at z = 2.038. This is the first report of BAL disappearance (i) over Mg ii, Al iii, C iv, and Si iv ions and (ii) in a weak emission-line quasar (WLQ). The discovery is based on four spectra from the Sloan Digital Sky Survey and one follow-up spectrum from Hobby-Eberly Telescope/Low-Resolution Spectrograph-2. The simultaneous C iv BAL disappearance and emergence at different velocities, together with no variations in the Catalina Real-Time Transient Survey light curve, indicate that ionization changes in the absorbing material are unlikely to cause the observed BAL variability. Our analyses reveal that transverse motion is the most likely dominant driver of the BAL disappearance/emergence. Given the presence of mildly relativistic BAL outflows and an apparently large C iv emission-line blueshift that is likely associated with strong bulk outflows in this WLQ, J0827+4252 provides a notable opportunity to study extreme quasar winds and their potential in expelling material from inner to large-scale regions.

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BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 5.07
Web of Science (2017): Impact factor 6.634
Web of Science (2017): Indexed yes
Scopus rating (2016): CiteScore 4.45
Web of Science (2016): Impact factor 5.522
Web of Science (2016): Indexed yes
Scopus rating (2015): CiteScore 4.33
Web of Science (2015): Impact factor 5.487
Web of Science (2015): Indexed yes
Scopus rating (2014): CiteScore 4.34
Characterization of the in-flight properties of the Planck telescope
The European Space Agency's Planck satellite was launched on 14 May 2009, and surveyed the sky stably and continuously between August 2009 and October 2013. The scientific analysis of the Planck data requires understanding the optical response of its detectors, which originates partly from a physical model of the optical system. In this paper, we use in-flight measurements of planets within similar to 1 degrees of boresight to estimate the geometrical properties of the telescope and focal plane. First, we use observed grating lobes to measure the amplitude of mechanical dimpling of the reflectors, which is caused by the hexagonal honeycomb structure of the carbon fibre reflectors. We find that the dimpling amplitude on the two reflectors is larger than expected from the ground, by 20% on the secondary and at least a factor of 2 on the primary. Second, we use the main beam shapes of 26 detectors to investigate the alignment of the various elements of the optical system, as well as the large-scale deformations of the reflectors. We develop a metric to guide an iterative fitting scheme, and are able to determine a new geometric model that fits the in-flight measurements better than the pre-flight prediction according to this metric. The new alignment model is within the mechanical tolerances expected from the ground, with some specific but minor exceptions. We find that the reflectors contain large-scale sinusoidal deformations most probably related to the mechanical supports. In spite of the better overall fit, the new model still does not fit the beam measurements at a level compatible with the needs of cosmological analysis. Nonetheless, future analysis of the Planck data would benefit from taking into account some of the features of the new model. The analysis described here exemplifies some of the limitations of in-flight retrieval of the geometry of an optical system similar to that of Planck, and provides useful information for similar efforts in future experiments.

General information
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Organisations: Astrophysics and Atmospheric Physics, National Space Institute, University of California at Santa Barbara, Università degli studi di Ferrara, European Space Research and Technology Centre (ESA/ESTEC), TICRA, California Institute of Technology, National Institute for Astrophysics, University Paris Diderot - Paris 7, Princeton University, Haverford College, University of British Columbia, Centre National de la Recherche Scientifique, University of Helsinki, Université Paris-Saclay, University of Oviedo
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Scopus rating (2017): CiteScore 3.8 SJR 2.265 SNIP 1.099
Web of Science (2017): Impact factor 5.565
Web of Science (2017): Indexed yes
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Scopus rating (2016): CiteScore 3.68 SJR 2.234 SNIP 1.199
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Web of Science (2016): Indexed yes
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Scopus rating (2015): CiteScore 3.5 SJR 2.545 SNIP 1.224
Web of Science (2015): Impact factor 5.185
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.82 SJR 2.883 SNIP 1.247
Web of Science (2014): Impact factor 4.378
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.01 SJR 2.747 SNIP 1.159
Web of Science (2013): Impact factor 4.479
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.14 SJR 2.903 SNIP 1.36
Web of Science (2012): Impact factor 5.084
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 3.42 SJR 2.737 SNIP 1.322
Web of Science (2011): Impact factor 4.587
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.849 SNIP 1.424
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.976 SNIP 1.438
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.907 SNIP 1.291
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.861 SNIP 1.333
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 3.646 SNIP 1.4
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 3.265 SNIP 1.338
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.862 SNIP 1.448
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.

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BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.8 SJR 2.265 SNIP 1.099
Web of Science (2017): Impact factor 5.565
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.68 SJR 2.234 SNIP 1.199
Web of Science (2016): Impact factor 5.014
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 3.5 SJR 2.545 SNIP 1.224
Web of Science (2015): Impact factor 5.185
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.82 SJR 2.883 SNIP 1.247
Web of Science (2014): Impact factor 4.378
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BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.01 SJR 2.747 SNIP 1.159
Web of Science (2013): Impact factor 4.479
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.14 SJR 2.903 SNIP 1.36
Web of Science (2012): Impact factor 5.084
ISI indexed (2012): ISI indexed yes
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BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 3.42 SJR 2.737 SNIP 1.322
Web of Science (2011): Impact factor 4.587
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.849 SNIP 1.424
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.976 SNIP 1.438
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.907 SNIP 1.291
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.861 SNIP 1.333
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 3.646 SNIP 1.4
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 3.265 SNIP 1.338
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.862 SNIP 1.448
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.157 SNIP 1.362
Web of Science (2003): Indexed yes
Scopus rating (2002): SJR 1.845 SNIP 1.35
Web of Science (2002): Indexed yes
Scopus rating (2001): SJR 1.607 SNIP 0.736
Web of Science (2001): Indexed yes
Scopus rating (2000): SJR 2.439 SNIP 1.04
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

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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, XiangTang 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
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Web of Science (2017): Impact factor 2.754
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BFI (2016): BFI-level 1
Scopus rating (2016): CiteScore 1.39 SJR 0.424 SNIP 0.775
Web of Science (2016): Impact factor 2.237
BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 1.27 SJR 0.437 SNIP 0.725
Evaluation of a Compton camera concept using the 3D CdZnTe drift strip detectors

At DTU Space, a high-resolution 3D CZT drift strip detector has been developed and a number of prototype detectors were fabricated, allowing for sub-mm position resolution at high energies (> 100 keV), as well as high energy resolution. For spectral and spatial performance, the 3D CZT prototype detectors were characterized with a fine collimated high-energy (Cs137) monochromatic beam (0.2 mm x 40 mm) using a digitizer with which the pulse shapes of the bipolar signals from all electrodes could be analysed. Data analysis consist of position determination for single as well as double interaction events handled within the detector. The double interaction events (e.g. Compton interaction) are utilized to characterize the imaging performance of the 3D CZT drift strip detector prototype when operating as a Compton camera.

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Organisations: Astrophysics and Atmospheric Physics, National Space Institute, Technical University of Denmark, University of California at Berkeley
Contributors: Owe, S. H., Kuvvetli, I., Budtz-Jørgensen, C., Zoglauer, A.
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BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 1.23 SJR 0.642 SNIP 1.04
Web of Science (2017): Impact factor 1.258
We report the first confirmation of a hot Jupiter discovered by the Transiting Exoplanet Survey Satellite (TESS) mission: HD 202772A b. The transit signal was detected in the data from TESS Sector 1, and was confirmed to be of planetary origin through radial velocity (RV) measurements. HD 202772A b is orbiting a mildly evolved star with a period of 3.3 days. With an apparent magnitude of $V = 8.3$, the star is among the brightest and most massive known to host a hot Jupiter. Based on the 27 days of TESS photometry and RV data from the CHIRON, HARPS, and Tillinghast Reflector Echelle Spectrograph, the planet has a mass of $1.017^{+0.070}_{-0.068} M_J$ and radius of $1.545^{+0.052}_{-0.060} R_J$, making it an inflated gas giant. HD 202772A b is a rare example of a transiting hot Jupiter around a quickly evolving star. It is also one of the most strongly irradiated hot Jupiters currently known.

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Organisations: Astrophysics and Atmospheric Physics, National Space Institute
Cruz, B., Henry, T., James, H., Addison, B., Liang, E., Davis, A. B., Tronsgaard, R., Worku, K., Brewer, J. M., Kürster, M.,
Howard, A. W., Isaacson, H., Latham, D. W., Mazeh, T., Petigura, E. A., Quinn, S. N., Shahaf, S., Siverd, R. J., Rodler, F.,
Reffert, S., Zakhozhay, O., Ricker, G. R., Vanderspek, R., Seager, S., Winn, J. N., Jenkins, J. M., T. Boyd, P., Fűrész, G.,

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BFI (2018): BFI-level 2
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Scopus rating (2017): CiteScore 4.41
Web of Science (2017): Impact factor 8.561
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 5.26
Web of Science (2016): Impact factor 8.955
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 4.8
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.57
Web of Science (2014): Indexed yes
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Scopus rating (2013): CiteScore 4.85
Web of Science (2013): Impact factor 14.137
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 5.51
Web of Science (2012): Impact factor 16.238
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 5.46
ISI indexed (2011): ISI indexed yes
BFI (2010): BFI-level 2
Web of Science (2010): Impact factor 15.206
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Hidden or missing outflows in highly obscured galaxy nuclei?

Context. Understanding the nuclear growth and feedback processes in galaxies requires investigating their often obscured central regions. One way to do this is to use (sub)millimeter line emission from vibrationally excited HCN (HCN-vib), which is thought to trace warm and highly enshrouded galaxy nuclei. It has been suggested that the most intense HCN-vib emission from a galaxy is connected to a phase of nuclear growth that occurs before the nuclear feedback processes have been fully developed.

Aims. We aim to investigate if there is a connection between the presence of strong HCN-vib emission and the development of feedback in (ultra)luminous infrared galaxies ((U)LIRGs).

Methods. We collected literature and archival data to compare the luminosities of rotational lines of HCN-vib, normalized to the total infrared luminosity, to the median velocities of 119 μm OH absorption lines, potentially indicating outflows, in a total of 17 (U)LIRGs.

Results. The most HCN-vib luminous systems all lack signatures of significant molecular outflows in the far-infrared OH absorption lines. However, at least some of the systems with bright HCN-vib emission have fast and collimated outflows that can be seen in spectral lines at longer wavelengths, including in millimeter emission lines of CO and HCN (in its vibrational ground state) and in radio absorption lines of OH.

Conclusions. We conclude that the galaxy nuclei with the highest $L_{\text{HCN-vib}}/L_{\text{IR}}$ do not drive wide-angle outflows that are detectable using the median velocities of far-infrared absorption lines. This is possibly because of an orientation effect in which sources oriented in such a way that their outflows are not along our line of sight also radiate a smaller proportion of their infrared luminosity in our direction. It could also be that massive wide-angle outflows destroy the deeply embedded regions responsible for bright HCN-vib emission, so that the two phenomena cannot coexist. This would strengthen the idea that vibrationally excited HCN traces a heavily obscured stage of evolution before nuclear feedback mechanisms are fully developed.
BFI (2018): BFI-level 2
Web of Science (2018): Indexed yes
BFI (2017): BFI-level 2
Scopus rating (2017): CiteScore 3.8 SJR 2.265 SNIP 1.099
Web of Science (2017): Impact factor 5.565
Web of Science (2017): Indexed yes
BFI (2016): BFI-level 2
Scopus rating (2016): CiteScore 3.68 SJR 2.234 SNIP 1.199
Web of Science (2016): Impact factor 5.014
Web of Science (2016): Indexed yes
BFI (2015): BFI-level 2
Scopus rating (2015): CiteScore 3.5 SJR 2.545 SNIP 1.224
Web of Science (2015): Impact factor 5.185
Web of Science (2015): Indexed yes
BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 2.82 SJR 2.883 SNIP 1.247
Web of Science (2014): Impact factor 4.378
Web of Science (2014): Indexed yes
BFI (2013): BFI-level 2
Scopus rating (2013): CiteScore 2.01 SJR 2.747 SNIP 1.159
Web of Science (2013): Impact factor 4.479
ISI indexed (2013): ISI indexed yes
Web of Science (2013): Indexed yes
BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 3.14 SJR 2.903 SNIP 1.36
Web of Science (2012): Impact factor 5.084
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
Scopus rating (2011): CiteScore 3.42 SJR 2.737 SNIP 1.322
Web of Science (2011): Impact factor 4.587
ISI indexed (2011): ISI indexed yes
Web of Science (2011): Indexed yes
BFI (2010): BFI-level 2
Scopus rating (2010): SJR 2.849 SNIP 1.424
Web of Science (2010): Indexed yes
BFI (2009): BFI-level 2
Scopus rating (2009): SJR 2.976 SNIP 1.438
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Scopus rating (2008): SJR 2.907 SNIP 1.291
Web of Science (2008): Indexed yes
Scopus rating (2007): SJR 2.861 SNIP 1.333
Web of Science (2007): Indexed yes
Scopus rating (2006): SJR 3.646 SNIP 1.4
Web of Science (2006): Indexed yes
Scopus rating (2005): SJR 3.265 SNIP 1.338
Web of Science (2005): Indexed yes
Scopus rating (2004): SJR 2.862 SNIP 1.448
Web of Science (2004): Indexed yes
Scopus rating (2003): SJR 2.157 SNIP 1.362
Web of Science (2003): Indexed yes
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.
HSTF160W Imaging of Very Massive Galaxies at 1.5 < z < 3.0: Diversity of Structures and the Effect of Close Pairs on Number Density Estimates

We present a targeted follow-up Hubble Space Telescope WFC3 F160W imaging study of very massive galaxies (logM_{star} / M_☉) > 11.25 selected from a combination of ground-based near-infrared galaxy surveys (UltraVISTA, NEWFIRM Medium Band Survey-II, UKIRT Infrared Deep Sky Survey (UKIDSS) Ultra-Deep Survey (UDS) at 1.5 < z < 3). We find that these galaxies are diverse in their structures, with ~1/3 of the targets being composed of close pairs, and span a wide range in sizes. At 1.5 < z < 2.5, the sizes of both star-forming and quiescent galaxies are consistent with the extrapolation of the stellar mass–size relations determined at lower stellar masses. At 2.5 < z < 3.0, however, we find evidence that quiescent galaxies are systematically larger than expected based on the extrapolation of the relation derived using lower stellar mass galaxies. We used the observed light profiles of the blended systems to decompose their stellar masses and investigate the effect of the close pairs on the measured number densities of very massive galaxies in the early universe.
We estimate correction factors to account for close-pair blends and apply them to the observed stellar mass functions (SMFs) measured using ground-based surveys. Given the large uncertainties associated with this extreme population of galaxies, there is currently little tension between the (blending-corrected) number density estimates and predictions from theoretical models. Although we currently lack the statistics to robustly correct for close-pair blends, we show that this is a systematic effect that can reduce the observed number density of very massive galaxies by up to a factor of ~1.5, and should be accounted for in future studies of SMFs.
Improved search for solar chameleons with a GridPix detector at CAST

We report on a new search for solar chameleons with the CERN Axion Solar Telescope (CAST). A GridPix detector was used to search for soft X-ray photons in the energy range from 200 eV to 10 keV from converted solar chameleons. No significant excess over the expected background has been observed in the data taken in 2014 and 2015. We set an improved limit on the chameleon photon coupling, \( \beta \gamma \leq 5.7 \times 10^{10} \) for \( 1 < \beta_m \leq 10^6 \) at 95% C.L. improving our previous results by a factor two and for the first time reaching sensitivity below the solar luminosity bound for tachocline magnetic fields up to 12.5 T.

General information

State: Published
Organisations: Astrophysics and Atmospheric Physics, National Space Institute, University of Patras, Universite Paris-Saclay, CERN, Russian Academy of Sciences, Max-Planck-Institut fur extraterrestrische Physik, INFN, University of Zaragoza, Istanbul Bilgi University, University of Bonn, Aristotle University of Thessaloniki, National Technical University of Athens, Demokritos National Centre for Scientific Research, University of Freiburg, Rudjer Boskovic Institute, Lawrence Livermore National Laboratory, Goethe University Frankfurt, Institute for Basic Science, University of British Columbia, Columbia University, Xi'an Jiaotong University
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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**

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Organisations: Department of Environmental Engineering, Air, Land & Water Resources, National Space Institute, Geodesy, Chinese Academy of Sciences
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Web of Science (2014): Impact factor 6.393
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BFI (2011): BFI-level 2
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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 an 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
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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.
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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 $M_p = 11.3 \pm 1.9 M_⊕$ and a radius of $R_p = 2.2 \pm 0.1 R_⊕$, yielding a mean density of $\rho_p = 5.6 \pm 1.9 g cm^{-3}$, 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.
Molecular and Ionized Gas Phases of an AGN-driven Outflow in a Typical Massive Galaxy at z = 2

Nuclear outflows driven by accreting massive black holes are one of the main feedback mechanisms invoked at high-z to reproduce the distinct separation between star-forming disk galaxies and quiescent spheroidal systems. Yet our knowledge of feedback at high-z remains limited by the lack of observations of the multiple gas phases in galaxy outflows. In this work, we use new deep, high spatial resolution ALMA CO(3-2) and archival Very Large Telescope/SINFONI Hα observations to study the molecular and ionized components of the active galactic nucleus (AGN)-driven outflow in zC400528, a massive main-sequence galaxy at z = 2.3 in the process of quenching. We detect a powerful molecular
outflow that shows a positive velocity gradient before a turnover and extends for at least similar to 10 kpc from the nuclear region, about three times the projected size of the ionized wind. The molecular gas in the outflow does not reach velocities high enough to escape the galaxy and is therefore expected to be reaccreted. Keeping in mind the various assumptions involved in the analysis, we find that the mass and energetics of the outflow are dominated by the molecular phase. The AGN-driven outflow in zC400528 is powerful enough to deplete the molecular gas reservoir on a timescale comparable to that needed to exhaust it by star formation. This suggests that the nuclear outflow is one of the main quenching engines at work in the observed suppression of the central star formation activity in zC400528.

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Organisations: National Space Institute, Max-Planck-Institut fur extraterrestrische Physik, University of Maryland, University of Bath, Swiss Federal Institute of Technology Lausanne, National Institute for Astrophysics, Max-Planck-Institut fur Astrophysik, University of California at Irvine, University College London, Max-Planck-Institut fur Radioastronomie, Sorbonne Universités, Hebrew University of Jerusalem, Observatorio de Madrid, CNRS

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Web of Science (2016): Impact factor 8.955
Web of Science (2016): Indexed yes
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Scopus rating (2015): CiteScore 4.8
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BFI (2014): BFI-level 2
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ISI indexed (2013): ISI indexed yes
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BFI (2012): BFI-level 2
Scopus rating (2012): CiteScore 5.51
Web of Science (2012): Impact factor 16.238
ISI indexed (2012): ISI indexed yes
Web of Science (2012): Indexed yes
BFI (2011): BFI-level 2
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

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Organisations: National Space Institute, Astrophysics and Atmospheric Physics

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Optical constants of magnetron sputtered Pt thin films with improved accuracy in the N- and O-electronic shell absorption regions

We present an experimental, self-consistent determination of the optical constants (refractive index) of Pt using a combination of photoabsorption and reflectance data in the photon energy range 25–778 eV, which includes the N- and O-shell electronic absorption edges of Pt. We compare our new experimental values with Pt optical constant data sets from the literature. Our Pt optical constant values reveal highly resolved absorption-edge fine structure around the O_2,3 and N_6,7 edges in both the absorptive and dispersive portions of the refractive index, which were missing in the earlier literature.

General information
State: Published
Organisations: Astrophysics and Atmospheric Physics, National Space Institute, Lawrence Livermore National Laboratory, Universite Paris-Saclay, Lawrence Berkeley National Laboratory
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
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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
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Resolving Seasonal Ice Velocity of 45 Greenlandic Glaciers With Very High Temporal Details
Seasonal glacier ice velocities are important for understanding controlling mechanisms of ice flow. For many Greenlandic glaciers, however, these measurements are limited by low temporal resolution. We present seasonal ice velocity changes, melt season onset and extent, and ice front positions for 45 Greenlandic glaciers using 2015–2017 Sentinel-1 synthetic aperture radar data. Seasonal velocity fluctuations of roughly half of the glaciers appear to be primarily controlled by surface melt-induced changes in the subglacial hydrology. This includes (1) glaciers that speed up with the onset of surface melt and (2) glaciers with comparable late winter and early melt season velocities that show significant slowdown during most of the melt season and speedup during winter. In contrast, less than a quarter of the study glaciers show strong correspondence between seasonal ice speed and terminus changes. Our results pinpoint seasonal variations across Greenland, highlighting the variable influence of meltwater on year-round ice velocities.

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BFI (2015): BFI-level 1
Scopus rating (2015): CiteScore 4.27 SJR 3.144 SNIP 1.496
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BFI (2014): BFI-level 1
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Web of Science (2014): Impact factor 4.196
Signatures of a jet cocoon in early spectra of a supernova associated with a γ-ray burst

Long γ-ray bursts are associated with energetic, broad-lined, stripped-envelope supernovae\textsuperscript{1,2} and as such mark the death of massive stars. The scarcity of such events nearby and the brightness of the γ-ray burst afterglow, which dominates the emission in the first few days after the burst, have so far prevented the study of the very early evolution of supernovae associated with γ-ray bursts\textsuperscript{3}. In hydrogen-stripped supernovae that are not associated with γ-ray bursts, an excess of high-velocity (roughly 30,000 kilometres per second) material has been interpreted as a signature of a choked
jet, which did not emerge from the progenitor star and instead deposited all of its energy in a thermal cocoon\textsuperscript{4}. Here we report multi-epoch spectroscopic observations of the supernova SN 2017iuk, which is associated with the γ-ray burst GRB 171205A. Our spectra display features at extremely high expansion velocities (around 115,000 kilometres per second) within the first day after the burst\textsuperscript{5,6}. Using spectral synthesis models developed for SN 2017iuk, we show that these features are characterized by chemical abundances that differ from those observed in the ejecta of SN 2017iuk at later times. We further show that the high-velocity features originate from the mildly relativistic hot cocoon that is generated by an ultra-relativistic jet within the γ-ray burst expanding and decelerating into the medium that surrounds the progenitor star\textsuperscript{7,8}. This cocoon rapidly becomes transparent\textsuperscript{9} and is outshone by the supernova emission, which starts to dominate the emission three days after the burst.

**General information**

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Organisations: National Space Institute, Astrophysics and Atmospheric Physics, Kyoto University, University of Rome La Sapienza, Stockholm University, Adam Mickiewicz University in Poznan, Max-Planck-Institut fur extraterrestrische Physik, Thüringer Landessternwarte Tautenburg, National Institutes of Natural Sciences - National Astronomical Observatory of Japan, Osservatorio Astronomico di Brera, Clemson University, University of Amsterdam, George Washington University, University of Warwick, National Institute for Astrophysics, Weizmann Institute of Science, PSL Research University, CSIC, University of Copenhagen, Technical University of Denmark, University of Leicester


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Spatially Resolved [C\textsc{ii}] Emission in SPT0346-52: A Hyper-starburst Galaxy Merger at z \sim 5.7

SPT0346-52 is one of the most luminous and intensely star-forming galaxies in the universe, with and . In this paper, we present ALMA observations of the 158 \textmu m emission line in this z = 5.7 dusty star-forming galaxy. We use a pixellated lensing reconstruction code to spatially and kinematically resolve the source-plane and rest-frame 158 \textmu m dust continuum structure at \sim 700 pc (~012) resolution. We discuss the deficit with a pixellated study of the \l_{[\text{C\textsc{ii}}]}/\l_{\text{FIR}} ratio in the source plane. We find that individual pixels within the galaxy follow the same trend found using unresolved observations of other galaxies, indicating that the deficit arises on scales 700 pc. The lensing reconstruction reveals two spatially and kinematically separated components (~1 kpc and ~500 km s^{-1} apart) connected by a bridge of gas. Both components are found to be globally unstable, with Toomre Q instability parameters everywhere. We argue that SPT0346-52 is undergoing a major merger, which is likely driving the intense and compact star formation.

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Organisations: National Space Institute, Astrophysics and Atmospheric Physics, University of Arizona, Universidad Diego Portales, Aix-Marseille University, Dalhousie University, European Southern Observatory, University of Florida, Flatiron Institute, Stanford University, University of California at Irvine, University of Illinois, Max-Planck-Institut fur Radioastronomie, University of Copenhagen
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Scopus rating (2015): CiteScore 4.8
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BFI (2014): BFI-level 2
Scopus rating (2014): CiteScore 4.57
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Web of Science (2012): Indexed yes
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BFI (2009): BFI-level 2
Web of Science (2009): Indexed yes
BFI (2008): BFI-level 2
Web of Science (2008): Indexed yes
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TESS Discovery of an Ultra-short-period Planet around the Nearby M Dwarf LHS 3844

Data from the newly commissioned *Transiting Exoplanet Survey Satellite* has revealed a "hot Earth" around LHS 3844, an M dwarf located 15 pc away. The planet has a radius of 1.303± 0.022R⊕ and orbits the star every 11 hr. Although the existence of an atmosphere around such a strongly irradiated planet is questionable, the star is bright enough (I = 11.9, K = 9.1) for this possibility to be investigated with transit and occultation spectroscopy. The star's brightness and the planet's short period will also facilitate the measurement of the planet's mass through Doppler spectroscopy.

**General information**

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Organisations: National Space Institute, Astrophysics and Atmospheric Physics, Aarhus University

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- Web of Science (2017): Impact factor 8.561
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- BFI (2016): BFI-level 2
- Scopus rating (2016): CiteScore 5.26
- Web of Science (2016): Impact factor 8.955
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- BFI (2015): BFI-level 2
- Scopus rating (2015): CiteScore 4.8
- Web of Science (2015): Indexed yes
- BFI (2014): BFI-level 2
- Scopus rating (2014): CiteScore 4.57
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- BFI (2013): BFI-level 2
- Scopus rating (2013): CiteScore 4.85
- Web of Science (2013): Impact factor 14.137
- ISI indexed (2013): ISI indexed yes
- Web of Science (2013): Indexed yes
- BFI (2012): BFI-level 2
- Scopus rating (2012): CiteScore 5.51
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\(_{\text{Ny}}\) - \(f_i\)). All frequencies (f\(_{\text{Ny}}\), f\(_8\), 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.
The Extremely Luminous Quasar Survey in the Sloan Digital Sky Survey Footprint. III. The South Galactic Cap Sample and the Quasar Luminosity Function at Cosmic Noon

We have designed the Extremely Luminous Quasar Survey (ELQS) to provide a highly complete census of unobscured UV-bright quasars during the cosmic noon, \( z = 2.8-5.0 \). Here we report the discovery of 70 new quasars in the ELQS South Galactic Cap (ELQS-S) quasar sample, doubling the number of known extremely luminous quasars in 4237.3 deg\(^2\) of the Sloan Digital Sky Survey footprint. These observations conclude the ELQS and we present the properties of the full ELQS quasar catalog, containing 407 quasars over 11,838.5 deg\(^2\). Our novel ELQS quasar selection strategy resulted in unprecedented completeness at the bright end and allowed us to discover 109 new quasars in total. This marks an increase of similar to 36% (109/298) in the known population at these redshifts and magnitudes, while we further are able to retain a selection efficiency of similar to 80%. On the basis of 166 quasars from the full ELQS quasar catalog, which adhere to the uniform criteria of the Two Micron All Sky Survey point source catalog, we measure the bright-end quasar luminosity function (QLF) and extend it one magnitude brighter than previous studies. Assuming a single power law with exponential density evolution for the functional form of the QLF, we retrieve the best-fit parameters from a maximum likelihood analysis. We find a steep bright-end slope of \( \beta \approx -4.1 \), and we can constrain the bright-end slope to \( \beta \leq -3.4 \) with 99% confidence. The density is well modeled by the exponential redshift evolution, resulting in a moderate decrease with redshift (\( \gamma \approx -0.4 \)).

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The Modular X- and Gamma-Ray Sensor (MXGS) of the ASIM Payload on the International Space Station

The Modular X- and Gamma-ray Sensor (MXGS) is an imaging and spectral X- and Gamma-ray instrument mounted on the starboard side of the Columbus module on the International Space Station. Together with the Modular Multi-Spectral Imaging Assembly (MMIA) (Chanrion et al. this issue) MXGS constitutes the instruments of the Atmosphere-Space Interactions Monitor (ASIM) (Neubert et al. this issue). The main objectives of MXGS are to image and measure the spectrum of X- and γ-rays from lightning discharges, known as Terrestrial Gamma-ray Flashes (TGFs), and for MMIA to image and perform high speed photometry of Transient Luminous Events (TLEs) and lightning discharges. With these two instruments specifically designed to explore the relation between electrical discharges, TLEs and TGFs, ASIM is the first mission of its kind. With an imaging system and a large detector area MXGS will, for the first time, allow estimation of the location of the source region and characterization of the energy spectrum of individual events. The sensors have fast readout electronics to minimize pileup effects, giving high time resolution of photon detection for comparison with measurements on μs-time scales of lightning processes measured by the MMIA and other sensors in space or on the ground. The detectors cover the large energy range of the relevant photon energies. In this paper we describe the scientific objectives, design, performance, imaging capabilities and operational modes of the MXGS instrument.

General information
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Time-dependent low-latitude core flow and geomagnetic field acceleration pulses

We present a new model of time-dependent flow at low latitudes in the Earth’s core between 2000 and 2018 derived from magnetic field measurements made on board the Swarm and CHAMP satellites and at ground magnetic observatories. The model, called CoreFlo-LL.1, consists of a steady background flow without imposed symmetry plus a time-dependent flow that is dominated by geostrophic and quasi-geostrophic components but also allows weak departures from equatorial symmetry. Core flow mode amplitudes are determined at 4-month intervals by a robust least-squares fit to ground and satellite secular variation data. The l1 norm of the square root of geostrophic and inertial mode enstrophies, and the l2 norm of the flow acceleration, are minimized during the inversion procedure. We find that the equatorial region beneath the core–mantle boundary is a place of vigorous, localized, fluid motions; time-dependent flow focused at low latitudes close to the core surface is able to reproduce rapid field variations observed at non-polar latitudes at and above Earth’s surface. Magnetic field acceleration pulses are produced by alternating bursts of non-zonal azimuthal flow acceleration in this region. Such bursts are prominent in the longitudinal sectors from 80–130°E and 60–100°W throughout the period studied, but are also evident under the equatorial Pacific from 130°E to 150°W after 2012. We find a distinctive interannual alternation in the sign of the non-zonal azimuthal flow acceleration at some locations involving a rapid crossover between flow acceleration convergence and divergence. Such acceleration sign changes can occur within a year or less and, when the structures involved are of large spatial extent, they can give rise to geomagnetic jerks at the Earth’s surface. For example, in 2014, we find a change in the sign of the non-zonal azimuthal flow acceleration under the equatorial Pacific as a region of flow acceleration divergence near 130°E changes to a region of flow acceleration convergence. This occurs at a maximum in the amplitude of the time-varying azimuthal flow under the equatorial Pacific and corresponds to a geomagnetic jerk at the Earth’s surface.
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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.

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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 missions. 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.