



Global surface temperature change analysis based on MODIS data in recent twelve years

K.B. Mao, Y. Ma, X.L. Tan, X.Y. Shen, G. Liu, Z.L. Li, J.M. Chen,

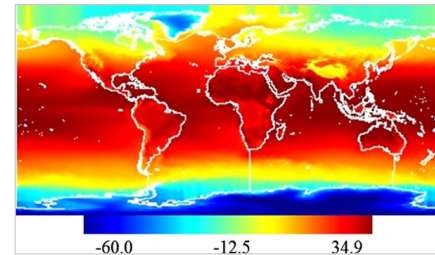
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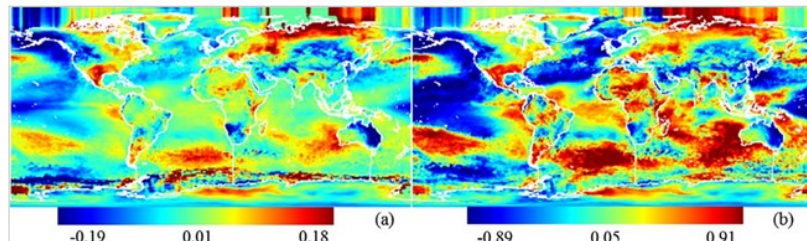
Abstract

Global surface temperature change is one of the most important aspects in global climate change research. In this study, in order to overcome shortcomings of traditional observation methods in meteorology, a new method is proposed to calculate global mean surface temperature based on remote sensing data. We found that (1) the global mean surface temperature was close to 14.35 °C from 2001 to 2012, and the warmest and coldest surface temperatures of the global in the recent twelve years occurred in 2005 and 2008, respectively; (2) the warmest and coldest surface temperatures on the global land surface occurred in 2005 and 2001, respectively, and on the global ocean surface in 2010 and 2008, respectively; and (3) in recent twelve years, although most regions (especially the Southern Hemisphere) are warming, global warming is yet controversial because it is cooling in the central and eastern regions of Pacific Ocean, northern regions of the Atlantic Ocean, northern regions of China, Mongolia, southern regions of Russia, western regions of Canada and America,

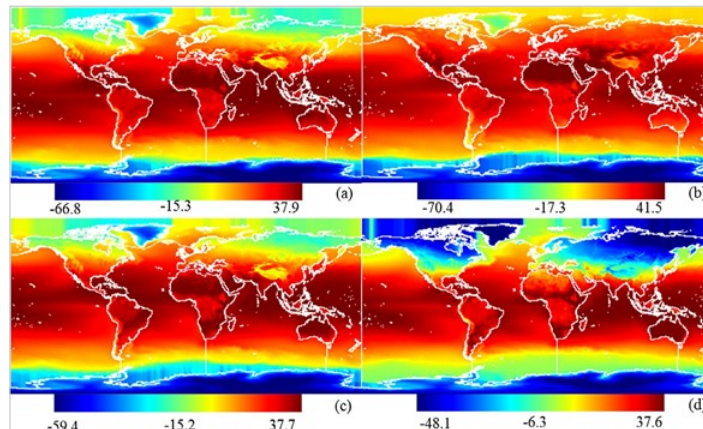
the eastern and northern regions of Australia, and the southern tip of Africa. The analysis of daily and seasonal temperature change indicates that the temperature change is mainly caused by the variation of orbit of celestial body. A big data model based on orbit position and gravitational-magmatic change of celestial body with the solar or the galactic system should be built and taken into account for climate and ecosystems change at a large spatial-temporal scale.



The mean surface temperature (°C) from 2001 to 2012



Global surface temperature change from 2001 to 2012: (a) rate (slope) of linear regression and (b) correlation coefficient



The change of mean surface temperature (°C) by seasons from 2001 to 2012: (a) March–May; (b) June–August; (c) September–November; and (d) December–February

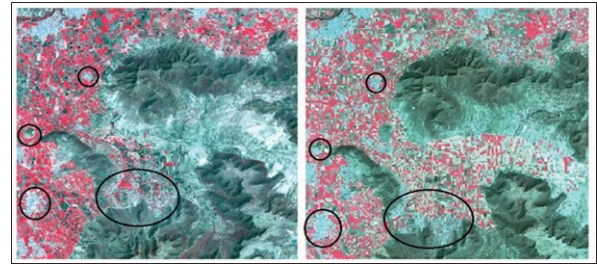
Detección del crecimiento urbano en el estado de Hidalgo mediante imágenes Landsat

Laura Cano Salinas, Rodrigo Rodríguez Laguna, José René Valdez Lazalde, Otilio Arturo Acevedo Sandoval y Rosa Icela Beltrán Hernández

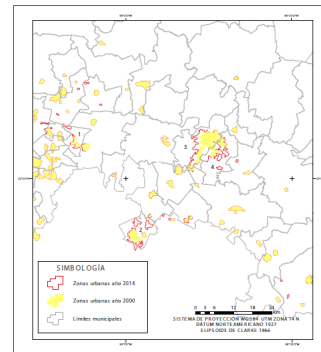
Resumen

La detección de la expansión urbana a través del procesamiento digital de imágenes satelitales proporciona información valiosa para el conocimiento de la dinámica del cambio de uso del suelo y su relación espacial con factores ambientales. Para aplicar o generar políticas efectivas de planeación del territorio es indispensable contar con un registro histórico de la distribución regional de los asentamientos humanos, elemento que en nuestro país es prácticamente nulo. Por esta razón, este texto tiene por objetivo determinar la tasa de crecimiento urbano durante el periodo 2000-2014 en el estado de Hidalgo, México, e identificar las zonas potenciales de expansión a partir de imágenes Landsat. Se utilizaron seis escenas Landsat para el análisis espacial de la cobertura urbana estatal y se evaluó su relación con el área de influencia vial. Como productos cartográficos se

obtuvieron dos mapas: uno de distribución de la cobertura urbana y otro de los municipios con mayor expansión, cuyas áreas están localizadas en la región del Valle del Mezquital. Sin embargo, Mineral de la Reforma, Tetepango, Tizayuca y Pachuca de Soto se destacan por sus tasas de crecimiento durante el periodo de estudio: 183.44%, 102%, 94% y 68.5%, respectivamente. En total, la superficie urbana estatal aumentó 72.3 km² del 2000 al 2014 con una tasa de crecimiento promedio de 1.8% por año. Dicho crecimiento se asoció con las áreas de influencia de infraestructura vial importante, como el Libramiento Arco Norte en Hidalgo. Por lo tanto, se considera al Valle del Mezquital y la Cuenca de México como regiones potenciales de expansión urbana en el estado.



Ejemplo de zonas con notable crecimiento urbano en la región del Valle del Mezquital, Hidalgo. Izquierda: año 2000 (RGB: 432). Derecha: año 2014 (RGB: 543).



Vista ampliada de los cuatro municipios con mayor tasa de crecimiento urbano en Hidalgo

<http://www.investigacionesgeograficas.unam.mx/index.php/rig/article/view/52339/50840>

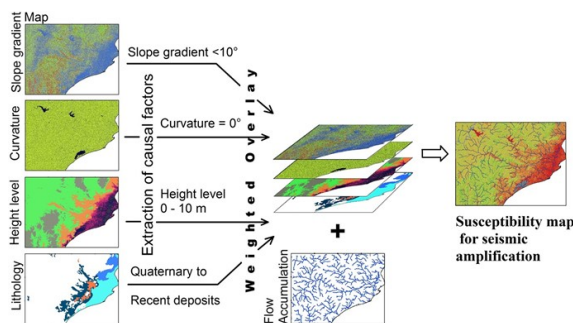
Estimation of seismic hazard in Odisha by Remote Sensing and GIS techniques

S. Dhar, A. K. Rai, P. Nayak

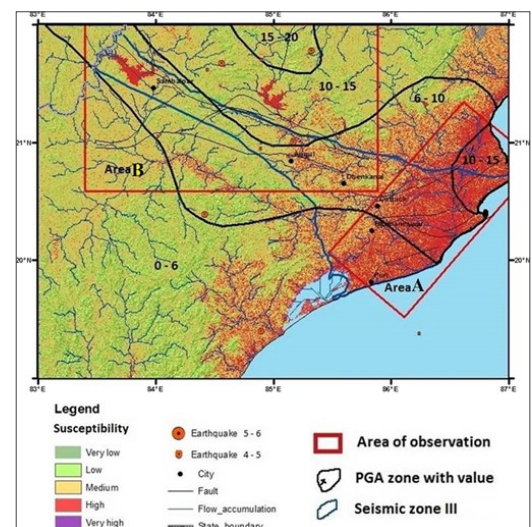
Abstract

This paper determines the risk of earthquake hazard due to amplification of seismic waves in coastal Odisha. Seismic hazards has been estimated by analysis of geomorphological features and thickness of unconsolidated soil cover. Areas with quaternary to recent deposits have great potential to amplify intensity of seismic waves and consequently the ground motion. Morphometric analysis of the DEM data has been conducted to identify areas with high potential of accumulation of unconsolidated sediment, and other parameters that influence deposit of loose, unconsolidated soil in the re-

gion. Weighted overlay method has been used to create soil amplification susceptibility map for the coastal Odisha. The Mahanadi basin shows dominant structural control on seismic activity. Lineament patterns are mostly directed in the WNW-ESE, NE-SW and NNW-SSE directions and may induce elongation of isoseismic patterns. The analysis also shows that the western, northern and middle parts of the study region have low to moderate susceptibility whereas the coastal Odisha have high susceptibility for seismic amplification due to thick unconsolidated sediment accumulation.



Schematic diagram of integrating various layers by weighted overlay technique to generate susceptibility map



Susceptibility map for seismic amplification due to soft sediment in and around seismic zone III of Odisha along with seismic zone map, PGA contour map, and location of selected area 'A' and 'B'.

<https://link.springer.com/article/10.1007/s11069-016-2712-3>

A web portal for hydrodynamical, cosmological simulations

A. Ragagnin, K. Dolag, V. Biffi, M. Cadolle Bel, N.J. Hamme,
A. Krukau, M. Petkova, D. Steinborn

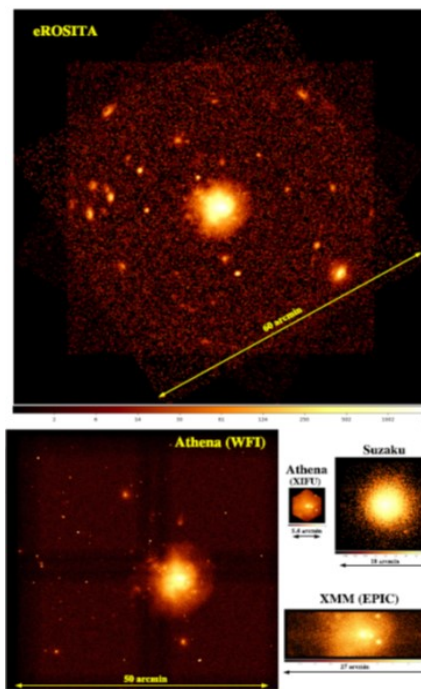
Abstract

This article describes a data centre hosting a web portal for accessing and sharing the output of large, cosmological, hydro-dynamical simulations with a broad scientific community. It also allows users to receive related scientific data products by directly processing the raw simulation data on a remote computing cluster.

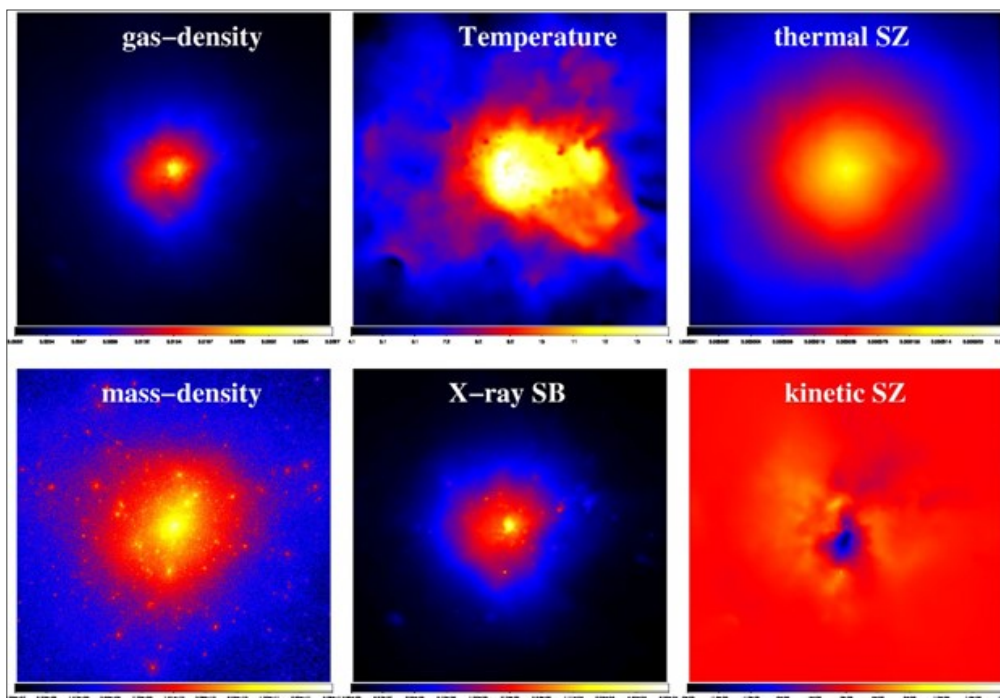
The data centre has a multi-layer structure: a web portal, a job control layer, a computing cluster and a HPC storage system. The outer layer enables users to choose an object from the simulations. Objects can be selected by visually inspecting 2D maps of the simulation data, by performing highly compounded and elaborated queries or graphically by plotting arbitrary combinations of properties. The user can run analysis tools on a chosen object. These services allow users to run analysis tools on the

raw simulation data. The job control layer is responsible for handling and performing the analysis jobs, which are executed on a computing cluster. The innermost layer is formed by a HPC storage system which hosts the large, raw simulation data.

The following services are available for the users: (I) CLUSTERINSPECT visualizes properties of member galaxies of a selected galaxy cluster; (II) SIMCUT returns the raw data of a sub-volume around a selected object from a simulation, containing all the original, hydro-dynamical quantities; (III) SMAC creates idealized 2D maps of various, physical quantities and observables of a selected object; (IV) PHOX generates virtual X-ray observations with specifications of various current and upcoming instruments.



Observation of the X-ray emission obtained from the combined ICM and AGN contribution, centred on the most massive cluster at $z = 0.3$, performed with different, current and future X-ray instruments, including the actual instrument simulations.



A sample of maps currently available within the SMAC service for a given selected cluster.

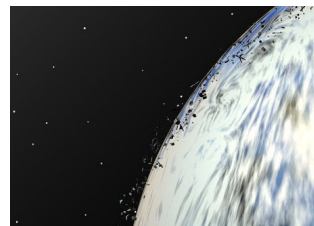
Environmental effect of space debris repositioning

C. Bombardelli, E.M. Alessi, A. Rossi, G.B. Valsecchi

Abstract

One of the proposed measures to both the maneuver cost and the limit the number of near-Earth orbiting fragments to a sustainable level is to actively remove large derelict objects from crowded orbital regions. The two main removal procedures considered so far are (1) a direct targeted reentry maneuver or (2) a deorbit maneuver resulting in a predicted 25-year lifetime for the target object. We study here the viability of a third option, which consists of repositioning the target to an optimally chosen altitude according to a selected benefit/cost objective function.

The objective function accounts for both the maneuver cost and the reduction of environmental criticality of the object. Numerical simulations are conducted to determine the optimal sequence of repositioning maneuvers for a given available deorbiting propellant. Results show that an optimal repositioning campaign tends to displace ton-class objects from around 900–1000 km altitude down to around 750–800 km altitude and to redistribute debris mass across lower density nearby altitudes. Comparisons with a 25-year lifetime deorbiting suggest a significant performance improvement.



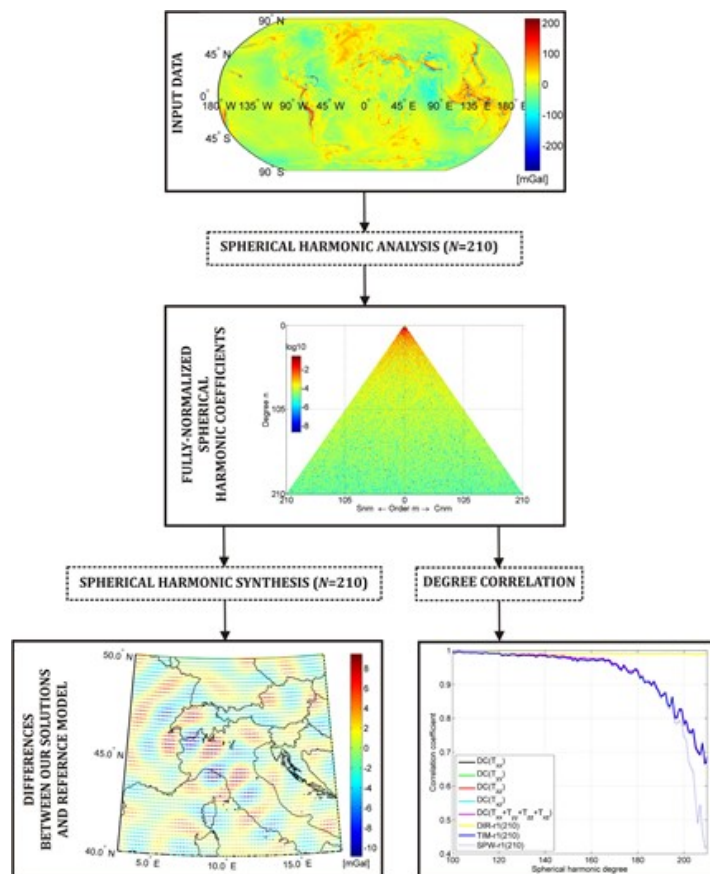
<http://www.sciencedirect.com/science/article/pii/S0273117717302491>

Regional gravity field modelling from GOCE observables

Martin Pitonák, Michal Sprláč, Pavel Novák, Robert Tenzer

Abstract

In this article we discuss a regional recovery of gravity disturbances at the mean geocentric sphere approximating the Earth over the area of Central Europe from satellite gravitational gradients. For this purpose, we derive integral formulas which allow converting the gravity disturbances from each of the four accurately measured gravitational gradients separately as well as from their combination. In our approaches we determine the gravity disturbances from each of the four accurately measured gravitational gradients separately as well as from their combination. Our regional gravitational field solutions are based on the GOCE EGG_TRF_2 gravitational gradients collected within the period from November 1 2009 until January 11 2010. Obtained results are compared with EGM2008, DIR-r1, TIM-r1 and SPW-r1. The best fit, in terms of RMS (2.9 mGal), is achieved for EGM2008 while using the third approach which combine all four well-measured gravitational gradients. This is explained by the fact that a-priori information about the Earth's gravitational field up to the degree and order 180 was used.



Results-testing schemes

<http://www.sciencedirect.com/science/article/pii/S0273117716305555>

Determination of a high spatial resolution geopotential model using atomic clock comparisons

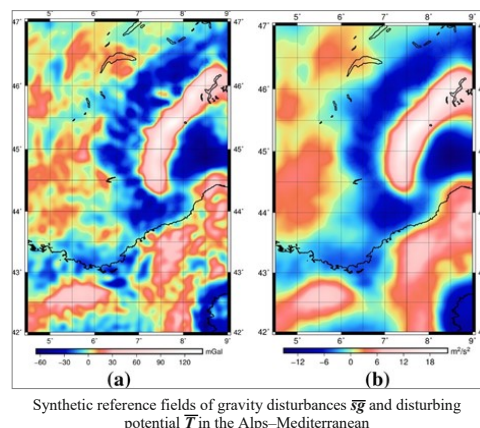
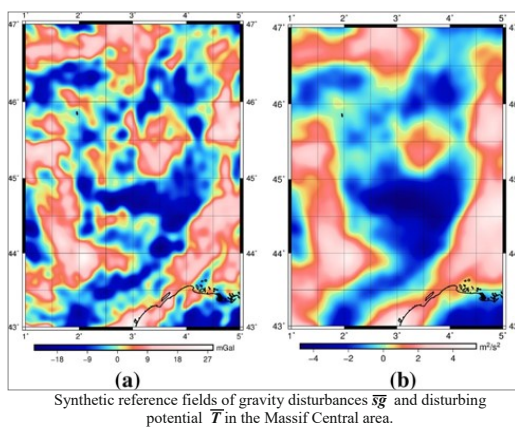
G. Lion, I. Panet, P. Wolf, C. Guerlin, S. Bize, P. Delva

Abstract

Recent technological advances in optical atomic clocks are opening new perspectives for the direct determination of geopotential differences between any two points at a centimeter-level accuracy in geoid height. However, so far detailed quantitative estimates of the possible improvement in geoid determination when adding such clock measurements to existing data are lacking. We present a first step in that direction with the aim and hope of triggering further work and efforts in this emerging field of chronometric geodesy and geophysics. We specifically focus on evaluating the contribution

of this new kind of direct measurements in determining the geopotential at high spatial resolution (≈ 10 km). We studied two test areas, both located in France and corresponding to a middle (Massif Central) and high (Alps) mountainous terrain. These regions are interesting because the gravitational field strength varies greatly from place to place at high spatial resolution due to the complex topography. Our method consists in first generating a synthetic high-resolution geopotential map, then drawing synthetic measurement data (gravimetry and clock data) from it, and finally reconstructing the

geopotential map from that data using least squares collocation. The quality of the reconstructed map is then assessed by comparing it to the original one used to generate the data. We show that adding only a few clock data points (less than 1% of the gravimetry data) reduces the bias significantly and improves the standard deviation by a factor 3. The effect of the data coverage and data quality on the results is investigated, and the tradeoff between the measurement noise level and the number of data points is discussed.



<https://link.springer.com/article/10.1007/s00190-016-0986-6>

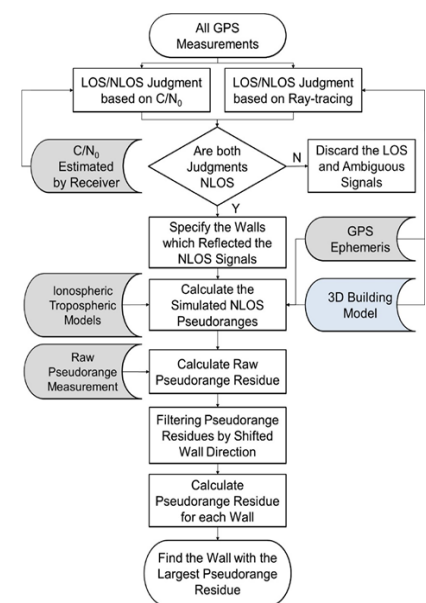
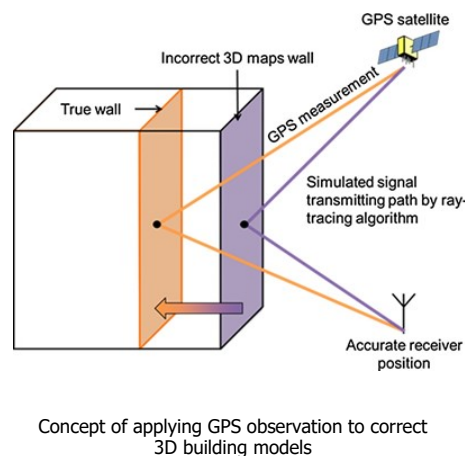
Optimization of 3D building models by GPS measurements

Yutaro Wada, Li-Ta Hsu, Yanlei Gu, Shunsuke Kamijo

Abstract

Recently, 3D building models have become an important aid to many positioning methods such as LiDAR and GPS positioning. Creating an accurate 3D building model requires accurate 2D building boundaries. We propose a method to correct the horizontal location errors of the 3D building model using GPS measurements. In an urban canyon, several GPS signals are reflected by buildings, and these reflections are potentially capable of indicating the correct position of the buildings. Starting with a raw 3D building model, we apply a signal ray tracing method to track the simulated reflection path of the GPS signal. Theoretically, the length of observed reflection path, which is known as the non-line-of-sight pseudorange, and the length of simulated reflection path should be similar. However, if the 3D map is not accurate, a difference between the pseudorange and simulated range is found. Using this difference, the proposed method estimates the true position of the wall of the 3D map. Results

show that the proposed method successfully corrects the position of the wall of the raw 3D map and achieves sub-meter accuracy.



Flowchart of calculating the pseudorange residual for all the walls

<https://link.springer.com/article/10.1007/s10291-015->

NOTICIAS

Descubriendo el campo magnético de la Tierra

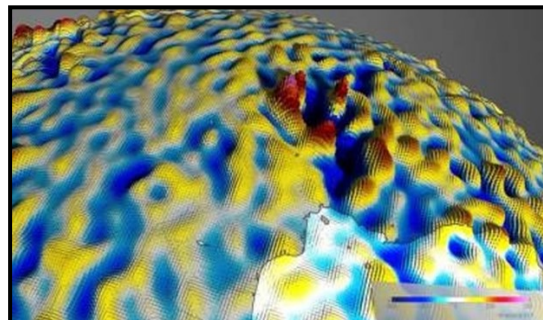
Los satélites Swarm de la Agencia Espacial Europea (ESA) están detectando minúsculos detalles en una de las capas más difíciles de observar del **campo magnético de la Tierra** y estudiando la historia magnética oculta en la corteza de nuestro planeta.

Podemos imaginar el campo magnético terrestre como una enorme envoltura que nos protege de la radiación cósmica y las partículas cargadas que

bombardean nuestro planeta con el viento solar. Sin él no existiría la vida tal y como la conocemos. La mayoría del campo se genera a más de 3.000 km de profundidad, por el movimiento del hierro fundido del núcleo externo. El 6% restante se debe, por una parte, a las corrientes eléctricas existentes en el espacio que rodea nuestro planeta y, por otra, a las rocas magnetizadas en la litosfera superior, la porción rígida

más exterior de la Tierra, formada por la corteza y el manto superior.

A pesar de que este 'campo magnético litosférico' es muy débil y, por ello, difícil de detectar desde el espacio, el trío de satélites Swarm ha sido capaz de cartografiar sus señales magnéticas. Tras tres años de recogida de datos, se acaba de publicar el mapa elaborado desde el espacio con la más alta resolución hasta la fecha.



"Al combinar las mediciones de Swarm con datos históricos del satélite alemán CHAMP, y usando una nueva técnica de modelización, hemos podido extraer señales mínimas de magnetización cortical", explica Nils Olsen, de la Universidad Técnica de Dinamarca, uno de los científicos responsables del nuevo mapa.

<http://noticiasdelaciencia.com/not/23590/desvelando-el-campo-magnetico-de->

Primera misión espacial para estudiar estrellas de neutrones

La misión NICER (Neutron star Interior Composition Explorer) de la NASA despegó el 3 de junio desde el Centro Espacial Kennedy (EE UU) y alcanzó con éxito la Estación Espacial Internacional a bordo de la nave de reabastecimiento SpaceX CRS-11.

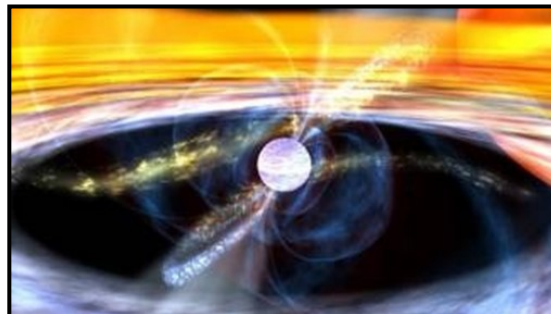
El objetivo principal de esta misión es estudiar en detalle los objetos observables más densos del universo: **las estrellas de neutrones**, descubiertas en 1967 por la astrofísica Jocely Bell.

Este tipo de objetos son remanentes de estrellas masivas, formados tras agotar su combustible, colapsar su núcleo y explotar las capas más exteriores. Se convierten así en esferas de gran densidad y fuertemente magnéticas. "La naturaleza de la materia bajo estas condiciones es un problema sin resolver desde hace décadas".

A pesar de que la física ha avanzado algunos modelos para describir lo que sucede en el interior de estas estrellas, la misión de

NICER es poner a prueba todos ellos. Durante 18 meses, se encargará de recoger los rayos X generados por los intensos campos magnéticos situados en los polos de estos potentes objetos.

Según ha explicado la NASA, observar las estrellas de neutrones con los instrumentos de la misión posibilitará analizar su estructura como no se ha conseguido hasta ahora, así como descubrir el fenómeno de alta energía que tiene lugar en su interior.



<http://noticiasdelaciencia.com/not/24662/primera-mision-espacial-para-estudiar-estrellas-de-neutrones/>

Primeras imágenes de Sentinel-2B transmitidas por láser

A punto de comenzar su labor en órbita, el satélite Sentinel-2B se ha enlazado por láser a Alphasat, a casi 36.000 km en el espacio, para enviar imágenes a la Tierra nada más capturarlas.

Esta prueba formaba parte de la puesta en servicio de **Sentinel-2B** e incluía la captura de una tira de imágenes, desde Europa al norte de África, y el envío de los datos en tan sólo seis minutos. Esto se ha logrado gracias a la tecnología láser más avanzada, pero también a la estrecha colaboración de la ESA con las industrias espaciales y la Unión Europea.

Tras su lanzamiento el 7 de marzo, Sentinel-2B entró en servicio el 15 de junio, uniéndose a su gemelo, Sentinel-2A, que ya suministra una enorme cantidad de imágenes en alta resolución para el programa de vigilancia medioambiental *Copernicus* de la Unión Europea.

La misión Sentinel-2 no solo ofrece información para mejorar las prácticas agrícolas y registrar cambios en la cobertura terrestre, también ayuda a vigilar los bosques mundiales, detecta la contaminación en lagos y aguas litorales, y contribuye a cartografiar desastres. Muchas de estas aplicaciones dependen de la captura de imágenes de una misma área en rápida sucesión.

Los dos satélites Sentinel-2 de Copernicus giran en lados opuestos alrededor de la Tierra. Cada uno de ellos cubre una franja de 290 km de ancho, por lo que en conjunto abarcan la totalidad del planeta cada cinco días y ofrecen imágenes de Europa cada dos o tres días. No obstante, en ocasiones se necesita información más rápida o de forma continua, y ahí es donde entran en juego los láseres de estos satélites, que complementan a la red de estaciones terrestres estándar.

Los satélites Sentinel-2 están equipados con terminales que transmiten datos por láser a los satélites en órbita geoestacionaria, a continuación, estos satélites transmiten los datos de Sentinel-2 a las estaciones terrestres.



<http://noticiasdelaciencia.com/not/24778/primeras-imagenes-de-sentinel-2b-transmitidas-por-laser/>



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