

Press Release 20/07/2015

**GRAND PARIS EXPRESS
AND SATELLITES**

Work on the Grand Paris Express under close surveillance by satellite

With 200 additional kilometres of metro lines, 68 new stations, and 15 years of construction, the Grand Paris Express is a gigantic project. ALTAMIRA INFORMATION of the CLS Group, a subsidiary of CNES, ARDIAN and IFREMER, was commissioned by the Société du Grand Paris to monitor from space, to the nearest millimetre, the impact of the civil engineering operations along its track and the adjacent areas. This unprecedented satellite surveillance will cover 35 years, when historical studies are included.

This project is vital to the future of the Ile-de-France region. It will help decongest the existing transport systems, reduce traffic and road vehicle pollution, combat urban sprawl and the progressive disappearance of agricultural land and more generally facilitate economic development in the region.

By 2030, it will lead to:

- 200 additional kilometres of automated metro lines;
- 68 new stations that will link the transport hubs of Grand Paris, the three airports and the TGV (high-speed train) stations;
- 2 million new passengers being carried on a daily basis;
- and significantly shorter commuting times.

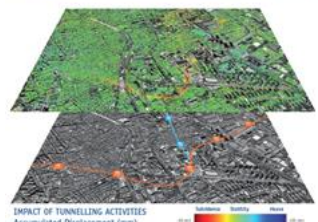
For this titanic engineering project, seven tunnelling machines will be used to bore Line 15 South between Noisy-Champ and Pont de Sèvres, and many more for the whole of the network over a period of 15 years.

In view of the region's geological and human history, this project is a real technical challenge because it involves overcoming geotechnical difficulties in certain areas (limestone quarries that have been exploited since well before the 19th century, underground galleries, areas of gypsum dissolution, etc.) and the network will have to take into account existing key infrastructures, and works will take place in densely or very densely built-up areas. Since each layer and building context can react differently, special surveillance will be necessary.

Given this background, the Société du Grand Paris decided to use all possible means to put this extended construction site under close surveillance, from the beginning of the study phase.

"When we launched this project, one of our main priorities was to minimize the impact by placing it under close surveillance. We therefore chose two complementary solutions. A real-time solution with a system using ground instruments to monitor any movements of buildings along the track of each tunnelling machine and a satellite-based solution, which will cover a larger perimeter, to be provided by ALTAMIRA INFORMATION. This second mode of surveillance enables us to monitor from space, the slightest movement of the ground over a zone of 1000 m centered on the tunneling route, down to the nearest millimetre. We felt that these two complementary systems, in situ and from space, would be the most effective solution for keeping the project under close surveillance.

For the space-based part, which is a considerable innovation in worksite surveillance, we have chosen ALTAMIRA INFORMATION, a leading company in this highly specialised area, which has been very attentive to our needs and which offered the best technical solution", explains Vincente Fluteaux, Infrastructures Engineer with the Société du Grand Paris.



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ALTAMIRA INFORMATION, a company specialising in the measurement of ground motion to the nearest millimetre by means of satellite radar imagery, was therefore commissioned by the *Société du Grand Paris* to:

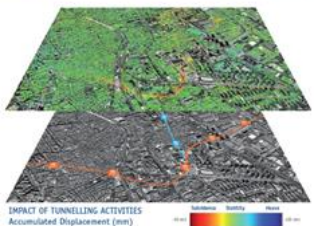
- report on any ground motion along the track of the tunnelling machines which may have occurred from 1995 until today;
- identify any built-up areas affected by these movements;
- continue surveillance until the start of work;
- measure ground surface movements during the work phase;
- continue surveillance once the project has ended.

This is an unprecedented project, for which ALTAMIRA INFORMATION, part of the CLS group, will use hundreds of satellite images from the satellite constellations of the European (ERS, ENVISAT, SENTINEL-1), Italian (COSMO-SkyMed) and German (TERRASAR-X) Space Agencies.

In practice, this means that during the engineering phase ALTAMIRA INFORMATION will deliver monthly bulletins stating which areas have remained stable and those in which motion has been observed. This information will keep the prime contractors fully informed of the impact of drilling on the surface, so that they can adapt their work accordingly.

Christophe Vassal, Chairman of the Executive Board of CLS, said: *"We will be putting a team of satellite specialists on this project. They will spend every day of the next 15 years watching over the work for the Grand Paris Express. ALTAMIRA INFORMATION will be applying its unique know-how based on nearly 20 years of experience in satellite radar interferometry, a technology capable of measuring ground movements to the nearest millimetre. We at CLS are very proud of this specialisation which is one of our leading activities."*

Know-how that has proven its worth in projects that have since become benchmarks, such as surveillance of the construction of the Barcelona High Speed Rail Line, the construction of the London Underground and surveillance of the railway network in Austria.



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ABOUT CLS

CLS, a subsidiary of CNES, ARDIAN and IFREMER, employs 550 people and operates in five strategic business sectors: the sustainable management of marine resources, environmental surveillance, maritime safety, support for onshore and offshore oil operations, and the monitoring of land transport. The company provides satellite services for the location and collection of data (each month it processes data from 40,000 transmitters, from drifting buoys, tagged animals, systems for monitoring fishing or merchant fleets, etc.), for the observation of oceans and inland waters (more than 20 satellites supply information to CLS on the Earth's seas and oceans every day), for the monitoring of land and sea-based activities (CLS processes 10,000 radar images each year) and for geolocation of terrestrial mobile units (40,000 trailers were tracked by the CLS Group subsidiary, Novacom Services, in 2014). CLS expects to increase its turnover from €96M in 2014 to €107M in 2015. The Group has been growing strongly in recent years and has set itself ambitious objectives by breaking into new markets.

www.cls.fr

ABOUT ALTAMIRA INFORMATION

ALTAMIRA INFORMATION, a subsidiary of CLS based in Barcelona and in Toulouse, specializes in the measurement of ground movements to the nearest millimetre using satellite radar images. Founded in 2000, it deploys the unique skills of some thirty engineers and PhDs specialized in radar, trained at the Polytechnic University of Catalonia and in leading European universities. On the strength of its experience with several national space agencies and in the commercial market, ALTAMIRA INFORMATION is one of the world's leading companies in the field of Earth observation by satellite radar. It offers tailored solutions for the detection and measurement of ground movements and the provision of cartographic products in the following areas: Oil and gas, civil engineering, and mining. In 2014, ALTAMIRA INFORMATION achieved turnover of €4.2M.

<http://www.altamira-information.com/>

ABOUT THE SOCIÉTÉ DU GRAND PARIS

The *Société du Grand Paris* is a public institution created by the French government to undertake construction of the new automatic metro for Greater Paris. It is responsible for overseeing a transport network project, the Greater Paris Express, whose route was agreed upon after an unprecedented public debate, taking into account the points of view of the French Government and the Ile-de-France Region and which has won very strong approval from the local inhabitants and their elected representatives.

ABOUT CNES

The French Space Agency is a public industrial and commercial establishment, responsible for helping to shape France's space policy, and implementing it within Europe. As such, its task is to bring space technologies concerning launchers and space systems to maturity and to invent the space systems of the future, so as to guarantee France's autonomous access to space. CNES is a pivotal player in Europe's space programme, and makes proposals on how France and Europe can remain leaders in the competitive world market. CNES also represents France as a member of the European Space Agency (ESA). It works closely with scientific and industrial partners with whom it develops the space programs it designs. It participates in several international projects, an indispensable requirement for any large-scale space policy.

www.cnes.fr

ABOUT ARDIAN

Founded in 1996 and led by Dominique Senequier, Ardian is a leading independent investment company that manages and/or gives advice on \$50 billion of assets in Europe, North America and Asia. Entrepreneurship has always been central to the company's approach, which offers its international investors superior performance while participating in the growth of businesses throughout the world. The investment philosophy of Ardian is based on three values: excellence, loyalty and entrepreneurship. The company's employees form the largest group of shareholders, with 80% of them choosing to invest in the company, thus reflecting their confidence in the strategy followed by the management team. Ardian has a strong international network, with more than 350 employees working in ten offices in Beijing, Frankfurt, Jersey, London, Luxembourg, Milan, New York, Paris, Singapore and Zurich. The company offers its 350 investors a diversified choice of funds covering the entire class of assets, with Direct Funds including Infrastructure, Mid Cap Buyout, Expansion, Ardian Growth, Co-Investment, Fund of Funds (primary, early secondary and secondary) and Private Debt.

www.ardian-investment.com

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