



Artist rendition of the TerraSAR-X satellite.

# INTERVIEW: INFOTERRA

WITH TERRASAR-X AND TANDEM-X GAINING POPULARITY AND ABOUT TO BECOME REALITY, GEO INTERVIEWED MARC TONDRIAUX (MT), CHAIRMAN OF THE INFOTERRA GROUP AND JOERG HERRMANN (JH), MANAGING DIRECTOR OF INFOTERRA GMBH RECENTLY.



Marc Tondriaux and Joerg Herrmann

**GEO:** Let us begin by asking how TerraSAR-X and the TanDEM-X programs began and which organisations are involved in each today?

**JH:** TerraSAR-X and TanDEM-X are implemented within two so-called Public Private Partnerships (PPPs) between the German Aerospace Centre DLR and its industry partner Astrium. The two partners share responsibilities and costs in the satellite system's construction and operation.

In order to ensure the commercial success of the TerraSAR-X mission, and to finance the follow-on spacecraft TerraSAR-X-2, Astrium has founded its 100% subsidiary Infoterra GmbH in 2001. We hold the exclusive commercial exploitation rights for TerraSAR-X data and will be granted the same rights for TanDEM-X in the near future.

**GEO:** As we recall, TerraSAR was initially involved in the production of Landcover maps for the whole of Germany. How did the 'X' get added to the name and what is the significance of that?

**JH:** TerraSAR is a market-derived Earth Observation satellite concept, thus "Terra" that features a Synthetic Aperture Radar, a "SAR" instrument, and has been defined in 2000.

Originally, it was planned to implement a SAR satellite system that would operate in X-band and in L-band. Technical aspects implied that the two related SAR instruments should be flown on individual satellites, TerraSAR-X and TerraSAR-L. However, the TerraSAR-L programme has not proceeded as quickly as the TerraSAR-X programme. While TerraSAR-X was technically mature by 2001 and

entered implementation in 2002, TerraSAR-L was further evaluated by ESA and - as of today - still lacks an implementation decision.

The original dual frequency concept of TerraSAR is suited to assess land cover information very efficiently. With TerraSAR-X alone we are focused on textural information of the Earth's surface. Without simultaneous L-band data we rather work with the strengths of X-band: very high resolution and change detection capabilities.

While Infoterra has produced – and still produces – landcover maps not only for Germany, but many other countries and regions across Europe within its Basic Landcover Mapping Service widely used within the European GMES activities, TerraSAR-X with its change detection capabilities will mainly be utilized for updating land cover databases.

**GEO: With the recent changes announced by Infoterra Group to provide services, are we likely to see the data distributed more widely outside of the scientific community?**

**MT:** The companies within the Infoterra Group have always been providing geo-information services to commercial customers around the globe. Many of these markets are currently developing and growing, and the scientific developments of the last years are of course contributing to this.

Particularly with TerraSAR-X – a spacecraft designed specifically to serve commercial applications – I am sure that the use of Earth observation data outside the scientific community will grow significantly. I do see a bright future for Earth observation data and geo-information service provision in the years to come.

**GEO: TanDEM-X as proposed will provide 2m resolution height data. How do you see this product comparing to currently available Shuttle Radar Topographic Mission (SRTM) data and what are some of the others benefits users will gain using TanDEM-X over SRTM?**

**JH:** While SRTM certainly is a valuable source of height information, TanDEM-X, compared to the SRTM X-band data, will provide a higher height accuracy of 2 meters versus SRTM's 6 meters, while the spatial resolution will be 12 meters as compared to 30 meters of SRTM. As you see, the data will be much more precise than what's available from SRTM.

Furthermore, TanDEM-X will cover the entire 150 million square kilometres of landmass on the globe within the first three years of the mission, while SRTM did not cover the complete globe. Only a handful of smaller countries have been covered completely. Thus, the global DEM created from TanDEM-X data will be unprecedented not only in

accuracy, but also in coverage.

**GEO: Can you explain some of the products and services that will be available within the short-term? What other products or services do you anticipate in the longer term?**

**JH:** Starting in early 2007, we will be able to deliver TerraSAR-X image products, including basic image products recorded in one of three operational modes, as well as enhanced image products such as orthorectified images, mosaics, or ascending/descending merges. These can be used as an input to a variety of applications such as topographic mapping, reconnaissance, and land use / land cover mapping.

Later in the year, geo-information products such as change detection maps or subsidence maps will be added to the portfolio.

We have gathered a number of partners within our TerraSAR-X Services Development Alliance, which are eager to start working on operational products based on TerraSAR-X data. Today, they are preparing and testing these products based on simulated data.

Furthermore, a wide range of scientific institutions will begin working with TerraSAR-X data as soon as it is available – and we are confident that a range of potential operational products and services will spring from these research activities. Over the next years, we are confident to be able to significantly enhance our service portfolio.

**GEO: The European Global Monitoring for Environment and Security (GMES) program and the GALILEO GPS program are strategically linked to the Infoterra Group. Can you expand upon that relationship and what is involved and some of the expectations and services that will flow from it?**

**MT:** Infoterra has established a leading role in the European GMES initiative of European Commission and ESA. All three entities of the group are leaders in a specific field of expertise, providing efficient, reliable services:

- Infoterra GmbH in Germany leads the GMES Land monitoring activities comprising a pan-European Land Cover Core Service as well as different down-streams services for regional and local users. The activities are focused on the implementation projects GSE Land and the Integrated Projects geoland and B4G;
- Infoterra France SAS leads the projects Risk EOS and Preview, both addressing risk management issues such as flooding, landslides or fires.
- Infoterra Ltd in the United Kingdom leads the project Respond, the global humanitarian relief programme.

The mid-term goal of GMES is to make a range of services available to public authorities and decision makers – this is a unique

chance for Infoterra to demonstrate the reliability, efficiency and operability of Earth observation based services and to introduce these services into the everyday working environment of public authorities across Europe.

Thus, we invest into the development of these services today and are confident that we will be able to benefit from these investments in the future.

Although Infoterra is not involved in the spatial part of the GALILEO program directly, the applications related to positioning, mobility and navigation are of great interest to us. On the one hand, accurate position information is an essential part of many of our products and we are looking forward to this new source. On the other hand, products that we provide can be an essential input for such services.

At the moment, we closely work with Astrium teams and other partners to develop applications that will help improve future GALILEO-based services. These applications range from cartographic databases which will help enhance the accuracy of GPS positioning, to provision of 3D data and virtual models that can be integrated into mobile, location-based applications.

Infoterra's extensive experience and strong links with the wireless telecom industry which is closely connected to GALILEO applications, enhance our position in this sector even further.

**GEO: Your organisation is also linked to the Global System of Earth Observation (GEOSS). What does that relationship bring to Infoterra Group? Is climate monitoring also part of that association?**

**MT:** GEOSS is definitely a key opportunity for our Group to develop new applications aiming at observing and predicting global changes, including issues dealing with climate changes.

However, GEOSS does not only address climate change. The 10-year implementation plan of GEOSS identifies a variety of activities closely related to our focus within GMES. Let me just name a few:

- Disasters – reducing loss of life and property from natural and human-induced disasters – that's what we are doing in Risk-EOS, PREVIEW and RESPOND;
- Water – improving water resources management through an improved understanding of the water cycles – a direct link to the GMES Land Monitoring activities;
- Agriculture – supporting sustainable agriculture and combating desertification – our commercial product FARMSTAR as well as activities in GMES Land Monitoring fit excellently into this GEOSS focus;
- Biodiversity - yet another major element in GMES Land monitoring.

Furthermore, I would like to stress our capabilities concerning products, data management, architecture and interoperability.

In both programs, GEOSS and GMES, we have the opportunity to work with research organisations specialized in climatology, environmental and oceanography issues. This gives us unique opportunities to anticipate future operational applications.

**GEO: ISTAR was recently merged into the Infoterra Group and that company has long been associated with cartographic production. Can we expect a strong and broad-based level of services associated with cartographic production now?**

**MT:** It is true that ISTAR has a long experience in cartography, operating for almost 20 years and being a pioneer in numerous fields of photogrammetry and remote sensing. Earlier this year, the company has been merged with Astrium teams specialising in the development of Earth Observation applications to create Infoterra France.

Integrating ISTAR's expertise and cartographic production capabilities into the Infoterra Group definitively enhances our operational capabilities. This investment perfectly complemented existing competences and assets of Infoterra, such as satellite and airborne data acquisition capabilities and development of advanced geo-information services. It is a significant step towards the implementation of a substantial portfolio of comprehensive geospatial solutions, designed for a wide range of applications.

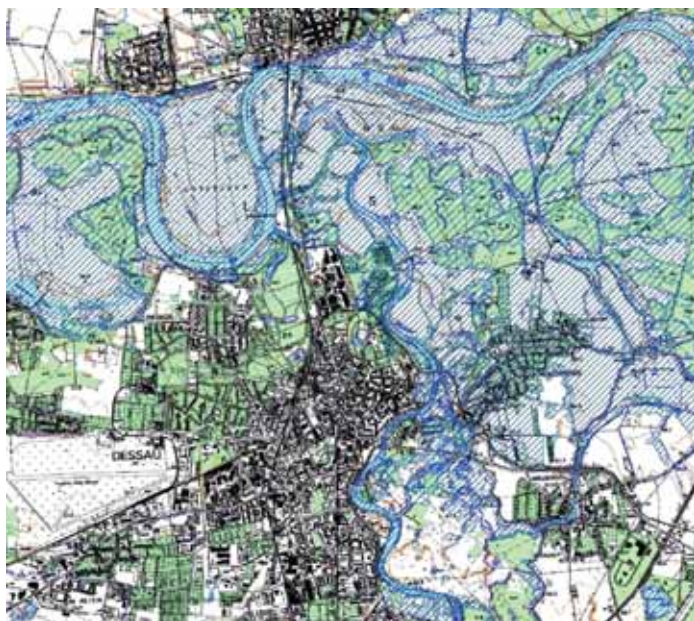
Although the integration is still quite recent, Istar's cartographic production, including the innovative processing suite Pixel

Factory™, has been established as part of a number of services developed across the whole Infoterra Group. Such services include security and risks management, agriculture and environmental applications, and several more.

**GEO: With some 60 European partners and about 35 overseas partners, can you tell us a bit more about the partners involved and why they are involved and their needs ahead?**

**MT:** Infoterra's partner network comprises numerous partners of very different nature. It includes commercial partners, such as companies that introduce our products and services to markets that they have already penetrated.

Our partners within the GMES projects include researchers, users that help us define their actual needs and requirements as well as service providers across Europe. We jointly work towards establishing operational services - which requires a substantial partner network of companies that will be able to provide tailored services to local decision makers in the future.



Satellite generated flood mapping.

Furthermore, we have established partnerships with R&D-oriented institutions, for example universities and research institutions, that work on advanced developments in specific areas of interest. Our joint goal is, obviously, to derive operational products from their research results, and to and bring those to market

**GEO: What rights will the German DLR hold in the new imaging systems and how is Germany anticipated to exercise its right with respect to quota and tasking?**

**JH:** The public-private partnership with the German Aerospace Centre DLR states that the data acquisition capacity of the satellite is to be shared 50/50 between commercial and scientific usage. While Infoterra will offer the right to use TerraSAR-X data, DLR retains the ownership. For research purposes, DLR will grant the right to use to the science community within an announcement of opportunity process. This approach will be adopted for TanDEM-X as well.

The system tasking will be coordinated between Infoterra for commercial use and DLR for scientific use, and will be implemented by the German Space Operation Centre GSOC, a part of DLR.

**GEO: Will TanDEM-X data come under 'Data Security Policy Law' and how is the going to play as INSPIRE and environmental benefits will, in effect, depend upon higher resolution data for more effective decision-making?**

**JH:** TanDEM-X data, as well as TerraSAR-X data, will be subject to the new German Data Security Policy Law.

The key advantage of the TanDEM-X elevation data base will be its homogeneous quality, thus, being independent of different standards in different political areas.

Let me name one key example of an obvious environmental benefit TanDEM-X data will have: Height accurate elevation data will increase the quality of the global flood models. As a result, more precise flood scenarios can be calculated. Risk-prone areas can be detected and - most importantly - evacuated prior to the actual flooding event.

**GEO: TerraSAR-X will have the ability to operate in 'multi mode', what is that and how will that relate to acquisition flexibility?**

**JH:** TerraSAR-X will be able to acquire data in three different operational modes:

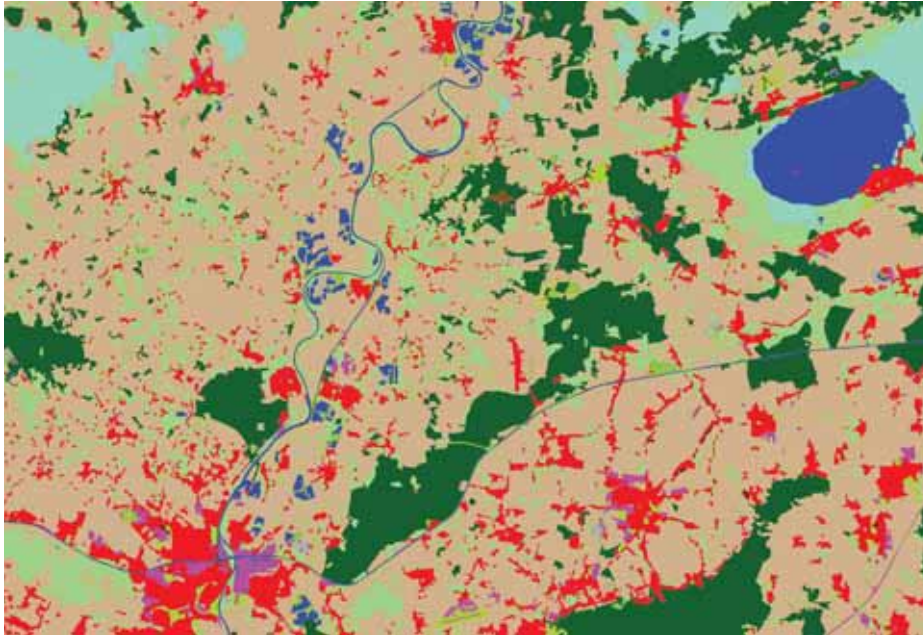
- the ScanSAR mode will record scenes of 100 x up to 1.500 square kilometres at a resolution of 16 meters;
- in StripMap mode the satellite will cover areas of 30 x up to 1.500 square kilometres at a resolution of three meters; and
- the SpotLight mode will collect data of areas of 10 x 5 square kilometres at a unique resolution of 1 meter.

TerraSAR-X's acquisition flexibility is warranted by its steerable antenna: Instead of featuring one solid radar sensor, it consists of 384 Transmit/Receive modules. Thus, it is possible to steer the antenna's beam in different directions, without having to actually roll the satellite, which is, however, possible as well. This unique flexibility results in a quick switching between sensor modes and view angles as well as a 2.5 day revisit time for any point on Earth in 95% of the cases.

**GEO: Commercial exploitation could lead to many new applications. One difficulty satellites have traditionally had in this respect, has related to production and delivery times on a sustainable basis, from which a business model can be built around. How will Infoterra Group overcome this obstacle more effectively?**

**JH:** For TerraSAR-X data, we offer our customers a so-called "Direct Access Service". This enables them to receive TerraSAR-X data at their own ground station, which is provided or suitably equipped through Infoterra. Thus, delivery times are absolutely minimized.

Even customers that order through us will be able to pick up the basic image data within a maximum 24 hours after recording of the



Satellite generated landcover mapping.

data. Let's assume the worst case scenario for an urgent case: The spacecraft has just passed the point of interest when the order is placed. At 95% probability, it will be able to record the data after 2.5 days, plus 24 hours for download, processing, and delivery, which results in a maximum of 3.5 days between order and pick-up from our ftp.

Lastly, TerraSAR-X does not face the same problems optical satellites do: Its radar sensor operates independent of daylight or cloud coverage, thus the acquisition of a viable image is possible anytime the spacecraft passes the point of interest. There is practically no risk of acquiring an unusable image, which makes this data a most reliable source of information.

Furthermore, I would like to add that in my opinion the problem you describe has been tackled very successfully by numerous satellite operators, and is no longer as eminent as it used to be. Almost all satellite operators have made good progress, and several sustainable and successful businesses build on the exploitation of satellite imagery today.

As an example, years ago, Spot Image has established a dedicated production unit that processes imagery rapidly and delivers products to end users in less than 24 hours after acquisition. Of course, when using optical satellites, weather conditions are crucial, but even here impressive progress has been made with regard to well-performing programming tools and enhanced revisit capabilities.

**Geoconnexion: A need will exist to train people in the use of radar products and services. What approach will you be using to accomplish this? Is RADARSAT-2 also associated with the group products and services?**

**JH:** We have already recognized this need, and have developed two SAR training courses

that we now offer to potential future TerraSAR-X users.

- *SARIntro* is a 5-day introductory course aiming to familiarize professionals in optical remote sensing with advantages and complementarities radar in general and TerraSAR-X in particular has to offer in comparison with optical data.
- *SARTrix* is a course that addresses image interpretation specialists who want to extend their knowledge in SAR data analysis and learn about image analysis tricks. The course contents are tailored the customers' technical, regional and application needs.

First responses have been extremely positive, and we are convinced that these courses help to introduce radar imagery, its advantages and the complementarities to optical data to a wide future user community.

At this point in time, there is no close connection between TerraSAR-X and Radarsat-2, or rather their distributors Infoterra and MacDonald, Dettwiler. However, a complementarity between radar data in C- and X-band is indisputable, and once Radarsat-2 is in orbit and operational, I am sure that both our companies will be interested in exploring synergy potentials.

**GEO: How are these new satellite based services going to help relief workers and those caught in emergency situations that would really benefit from enhanced satellite operation?**

**JH:** There are several ways in which Infoterra's services can support decision-makers and on-scene relief workers in crisis or emergency situations:

- Within the European GMES initiative, several of Infoterra's projects address these issues:
- The projects Risk EOS and Preview, both led by Infoterra France SAS, address risk

management issues such as flooding and fires. The services developed here are designed to support throughout all phases: prevention, early warning, crisis and post crisis.

- A global humanitarian relief programme is being developed within the project Respond, led by Infoterra Ltd.. This alliance of European and International organisations works with the humanitarian community to improve access to maps, satellite imagery and geographic information.

Furthermore, as soon as TerraSAR-X is operational, Infoterra will be able to provide data from an extremely reliable source that offers very high resolution imagery as well as near-real time data acquisition, as data can be downloaded to fixed or mobile ground stations around the globe.

**GEO: What are 'Fast Track Services'?**

**JH:** Fast Track Service, or FTS, is a term from the GMES context: It is used by the European Commission in an official communication that defines three Fast Track Services intended to be implemented by 2008:

- FTS addressing Information for Crisis Management
  - FTS addressing Marine Core Services
  - FTS addressing Land Monitoring Services
- Fast Track Services are pan-European precursor demonstrators of GMES Core Services implemented by pooling budget lines of mandated organisations such as DG-Regio, DG-ENV, DG-AGRI, or ESA, that are already available today.

Full core services are planned to be established from 2008 onwards based on dedicated operational GMES service lines that are still to be generated.

The idea of a Fast Track Service is to establish a precursor service with a limited budget. The fact that this precursor service is implemented successfully will prove that the much larger investments planned to be made starting 2008 will be spent meaningfully. That way, the political support of these expenditures through all EC and EEA member states will hopefully be secured.

Infoterra hopes to be involved in the implementation of fast track services, however, no final decisions towards implementation and assignments have been taken yet.

For more information: [www.infoterra-global.com](http://www.infoterra-global.com)