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3D Layerstack

Showcase of in-production solar power technologies in Seville province, Andalusia, Spain

Sentinel-2 MSI acquired on **11 June 2019** at 11:06:21 UTC
Sentinel-1 CSAR IW acquired on **20 October 2019** at 06:26:23 & 18:18:36 UTC
Sentinel-2 MSI acquired on **24 October 2019** at 11:10:49 UTC
Sentinel-2 MSI acquired on **26 October 2019** at 11:01:41 UTC

Author(s): Sentinel Vision team, VisioTerra, France - svp@visioterra.fr

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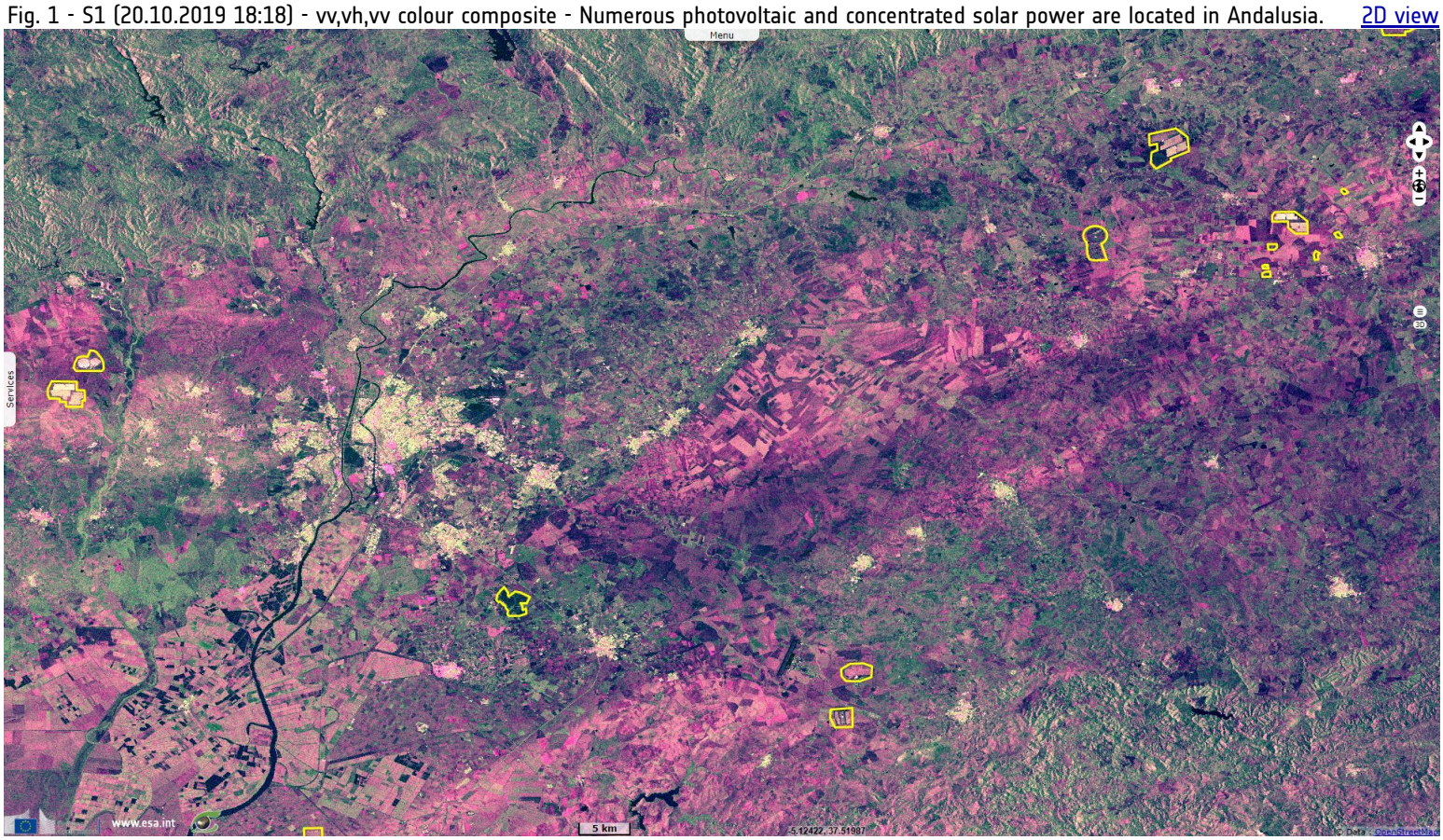
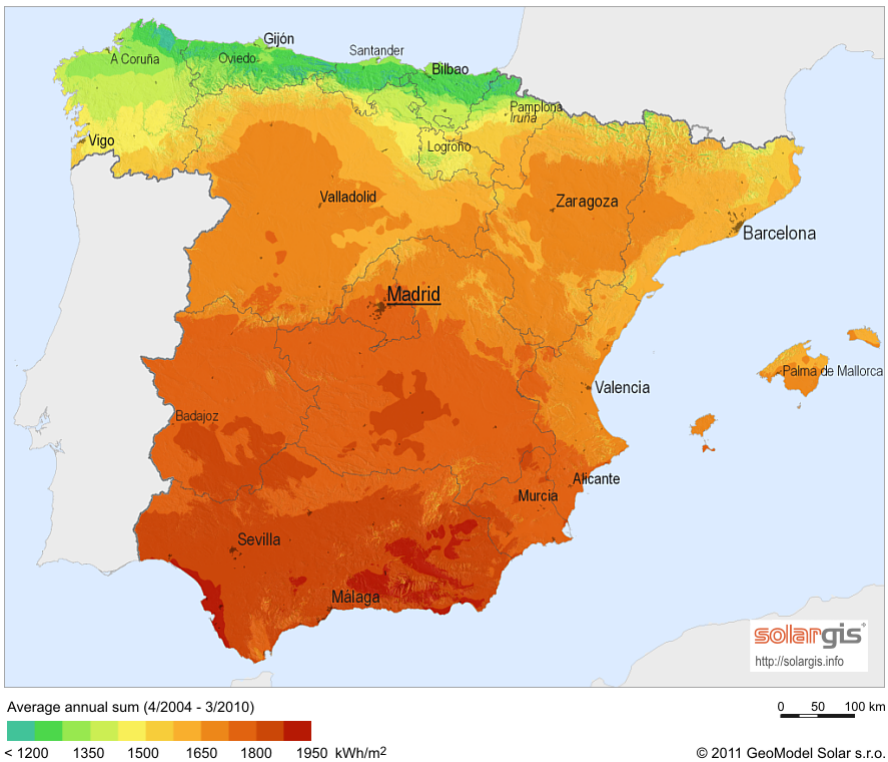
Fig. 1 - S1 (20.10.2019 18:18) - vv,vh,vv colour composite - Numerous photovoltaic and concentrated solar power are located in Andalusia. 2D view



Areas in the province of Seville receives at least nine hours of sunshine 320 days per year, with 15 hours per day in mid summer. With 2000 kWh/m2/yr, it is no wonder solar energy has bright perspectives there.

Global horizontal irradiation Spain



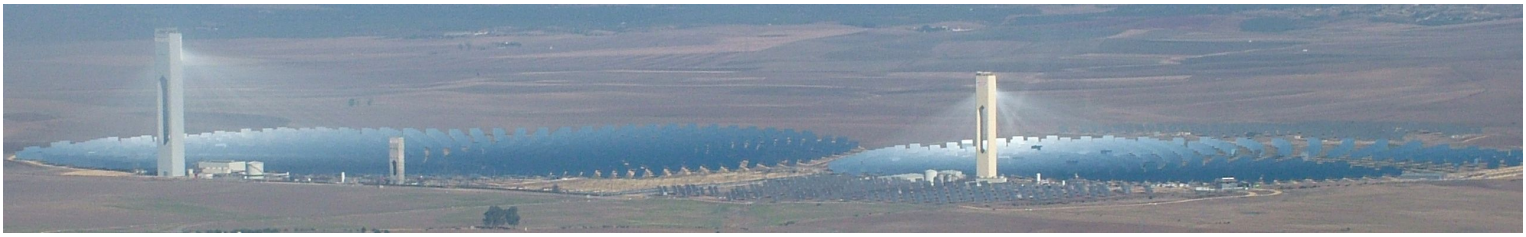
Global Horizontal Irradiation Map of Spain - source: SolarGIS GeoModel Solar 2011

Spain initially had a leading role in the development of solar power. Generous prices for grid connected solar power were offered to encourage the industry. The boom in solar power installations were faster than anticipated and prices for grid connected solar power were not cut to reflect this, leading to a fast but unsustainable boom in installations. Spain would find itself second only to Germany in the world for solar power installed capacity.

In the wake of the 2008 financial crisis, the Spanish government drastically cut its subsidies for solar power and capped future increases in capacity at 500 MW per year, with effects upon the industry worldwide. Between 2012 and 2016, new installations stagnated in Spain while growth accelerated in other leading countries leaving Spain to lose much of its world leading status to countries such as Germany, China and Japan.

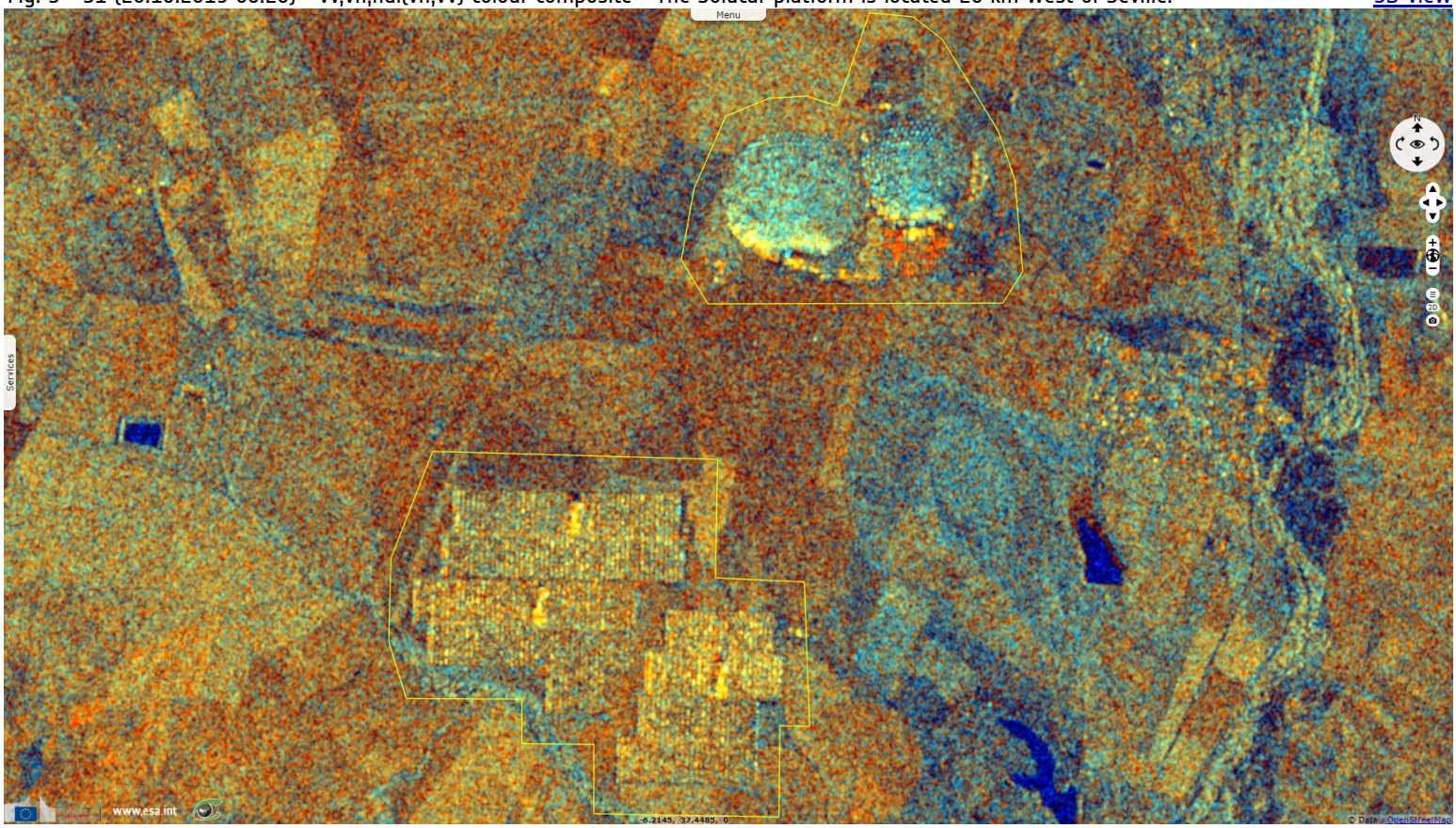
2019 is likely to see the industry beginning a dramatic rebirth following a series of positive developments not least because grid parity prices for solar power were exceeded several years ago, meaning that growth in the sector would likely occur even without subsidies.

Fig. 2 - S2 (26.10.2019) - 4,3,2 natural colour - The Solucar Platform: PS10, PS20 & Solnova Solar Power Station. 3D view



Aerial view of the PS10 and PS20 solar power plants at Solucar Complex in Seville, Spain. Source: Graf-flugplatz.

Fig. 3 - S1 (20.10.2019 06:26) - vv,vh,ndi(vh,vv) colour composite - The Solucar platform is located 20 km west of Seville. 3D view



The Solucar platform has 300 MW of installed capacity: 50 MW are from solar tower technology, 250 MW are obtained from solar trough technology. The Solnova Solar Power Station is a large CSP solar power station in Sanlúcar la Mayor, Seville, Spain. It utilizes the parabolic trough technology, and includes five sub-plants of 50 MW each, totalling the installed capacity to 250 MW.

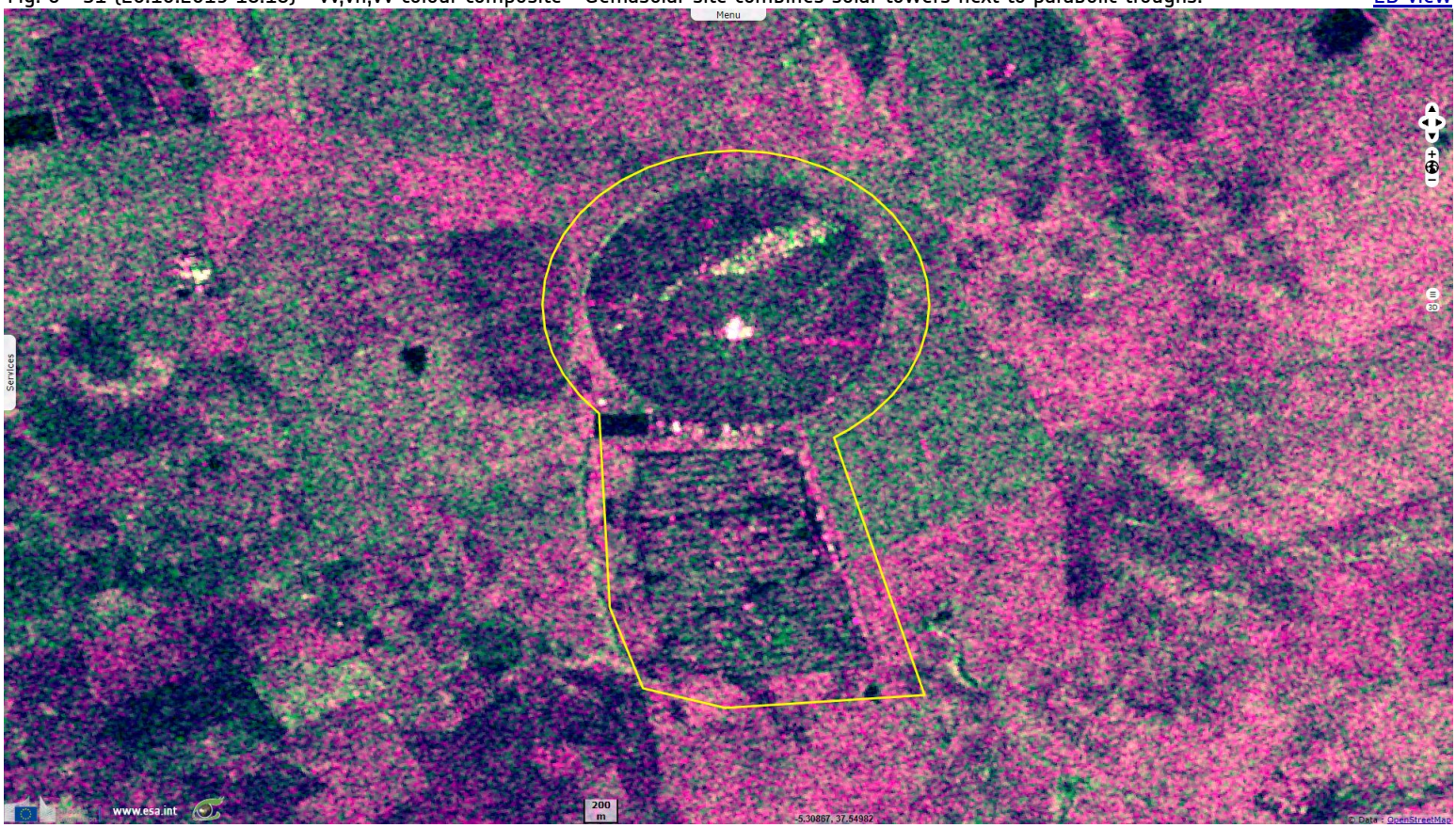
Fig. 4 - 20.10.2019 18:18 - vv,vh,vv colour composite - The ascending view at the same date results in quite different backscattering values. 3D view

The PS10 Solar Power Plant (Spanish: Planta Solar 10), is the world's first commercial concentrating solar power tower operating near Seville, in Andalusia, Spain. The 11 MW solar power tower produces electricity with 624 (1255 for PS20) large movable mirrors called heliostats. The 20 MW PS20 solar power plant (PS20) was the world's most powerful solar power tower until 2014. Each heliostat, with a surface area of 120m², reflects the solar radiation it receives onto the receiver, located on the top of a 165-metre-high tower where heat is stored in tanks as superheated and pressurized water at 50 bar and 285 °C. It produces saturated steam at 275 °C which is converted into electricity by a turbine generator. The energy conversion efficiency is approximately 17%.

Fig. 5 - S2 (06.11.2019) - 4,3,2 natural colour - Don Rodrigo photovoltaic solar park, a few kilometers south-east of Seville. 2D view

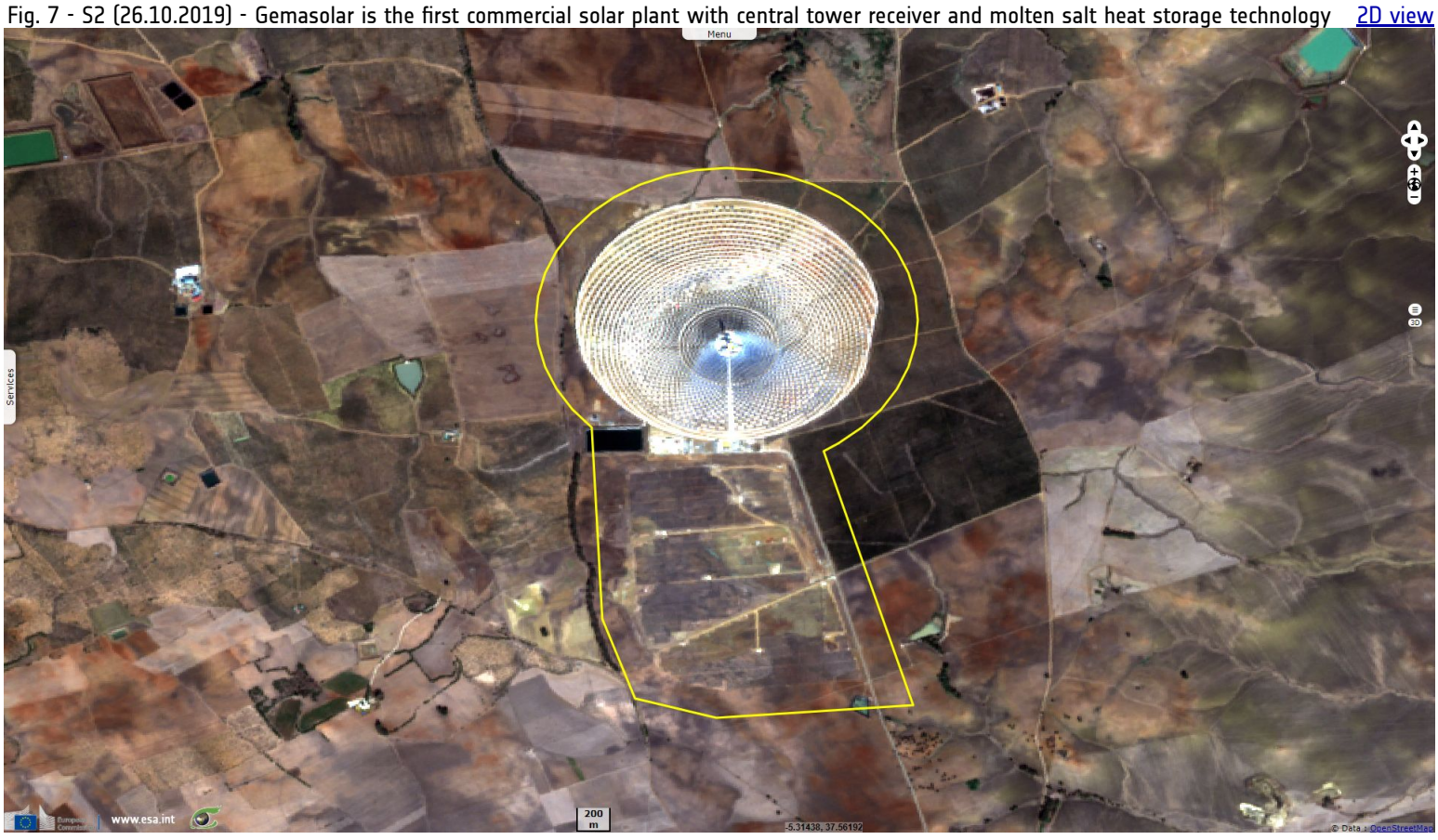
"*Completed in December 2018, Don Rodrigo has a total capacity of 175 MWp and an annual output of 300 GWh, which is equivalent to the annual consumption of approximately 93,000 average Spanish households*" - source: BayWa r.e.

Fig. 6 - S1 (20.10.2019 18:18) - vv,vh,vv colour composite - Gemasolar site combines solar towers next to parabolic troughs. 2D view



Gemasolar is a concentrated solar power plant with a molten salt heat storage system. It is located within the city limits of Fuentes de Andalucía in the province of Seville, Spain.
The plant is of the solar power tower type CSP and uses concepts pioneered in the Solar One and Solar Two demonstration projects, using molten salt as its heat transfer fluid and energy storage medium. Originally called Solar Tres, it was renamed Gemasolar.
The project, which has received a subsidy of five million euros from the European Commission and a loan of 80 million euros from the European Investment Bank, makes use of the Solar Two technology tested in Barstow, California, but is approximately three times the size. It makes use of several advances in technology after Solar Two was designed and built.

Fig. 7 - S2 (26.10.2019) - Gemasolar is the first commercial solar plant with central tower receiver and molten salt heat storage technology 2D view

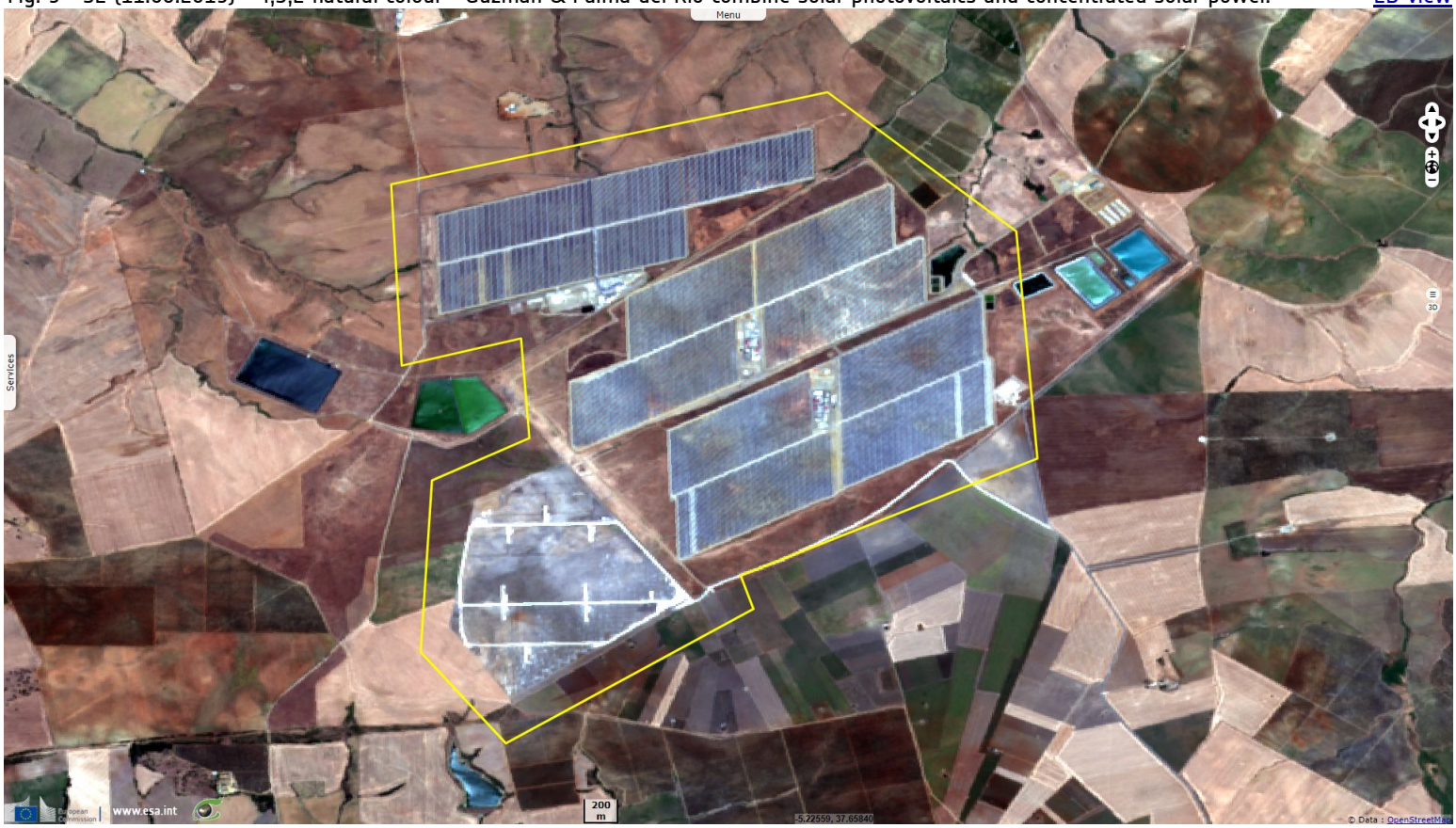


Gemasolar is the first commercial solar plant with central tower receiver and molten salt heat storage technology. It consists of 2650 heliostats, each with a 120 square metres aperture area (equivalent to a 30 hectares solar heliostat aperture area) and distributed in concentric rings around the 140-metre-high tower receiver. Its storage system allows it to produce electricity for 15 hours without sunlight (at night or on cloudy days). In 2013, the plant achieved continuous production, operating 24 hours per day for 36 consecutive days, a result which no other solar plant has attained so far.

Fig. 8 - S2 (11.06.2019) - Gemasolar with its mirrors oriented toward a near-zenith sun. 2D view

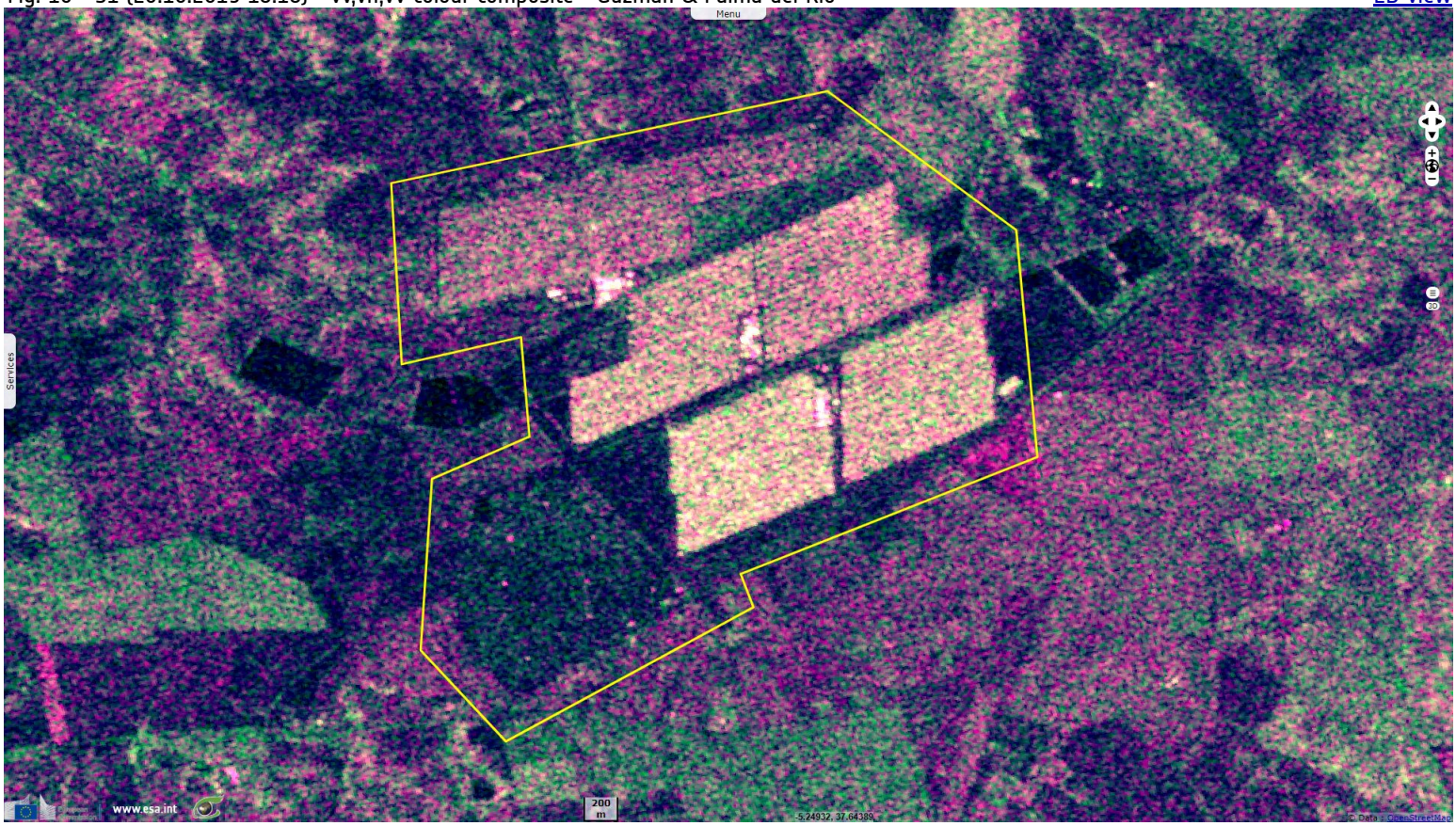
Almería Solar Platform Parabolic trough - source.

Fig. 9 - S2 (11.06.2019) - 4,3,2 natural colour - Guzman & Palma del Rio combine solar photovoltaics and concentrated solar power. 2D view



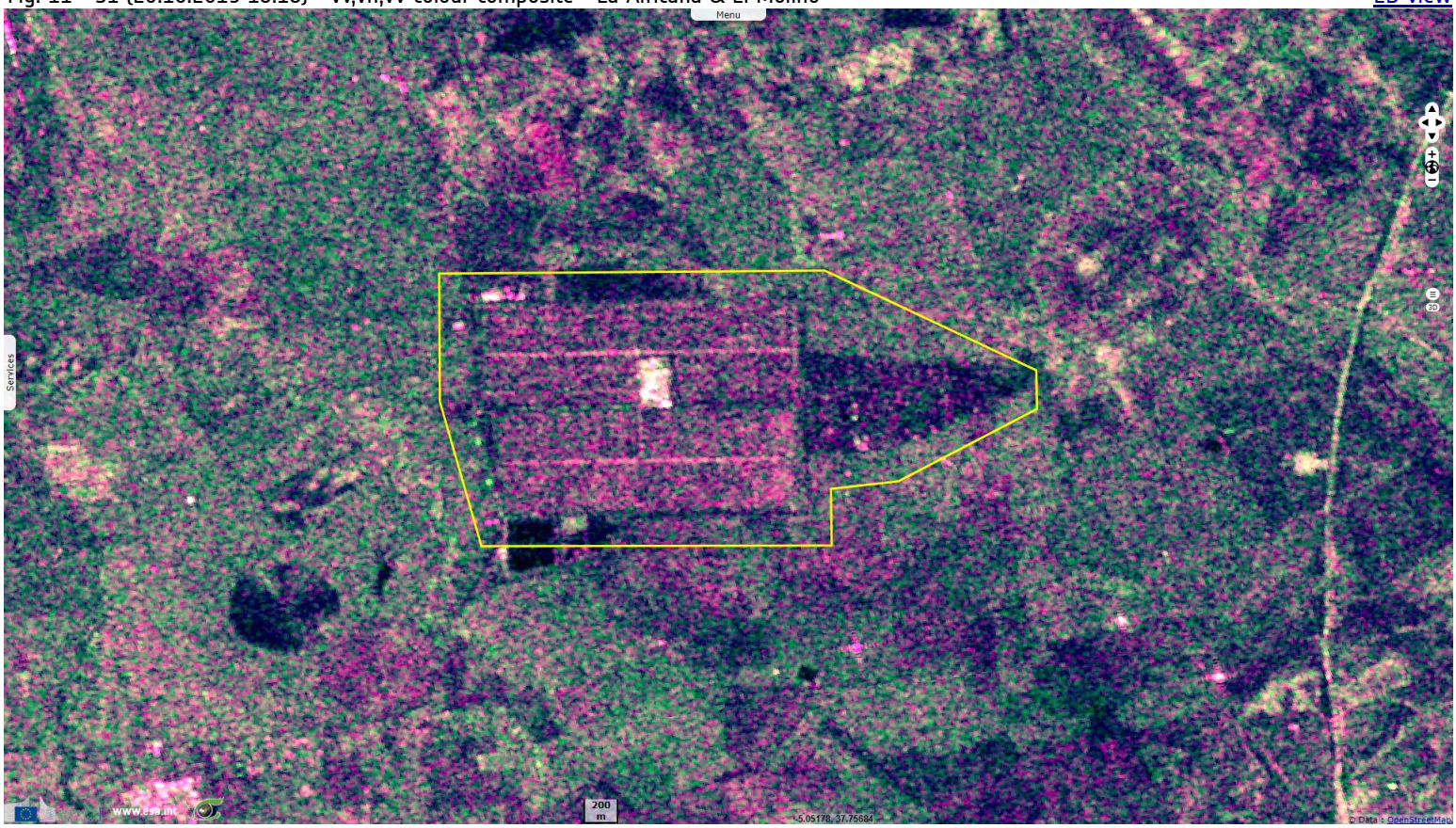
Spain was one of the first countries to deploy large scale solar photovoltaics and as of 2018 the first country for concentrated solar power in the world. In 2018, the cumulative total solar power installed was 7011 MW, of which 4707 MW were solar PV installations and 2300 MW were concentrated solar power. It is an usually high ratio for the latter since the cost of PV dropped during the 2010s.

Fig. 10 - S1 (20.10.2019 18:18) - vv,vh,vv colour composite - Guzman & Palma del Rio 2D view



The Palma del Río plant has an area of more than 200 football fields and has an area of more than 340,000 m² of parabolic mirrors that, in an automated way and imitating the movement of sunflowers, work during the sun's hours, oriented from Dawn at sunset to reflect the maximum amount of solar energy and direct it to an oil filled collector tube that reaches a temperature above 400 degrees Celsius.

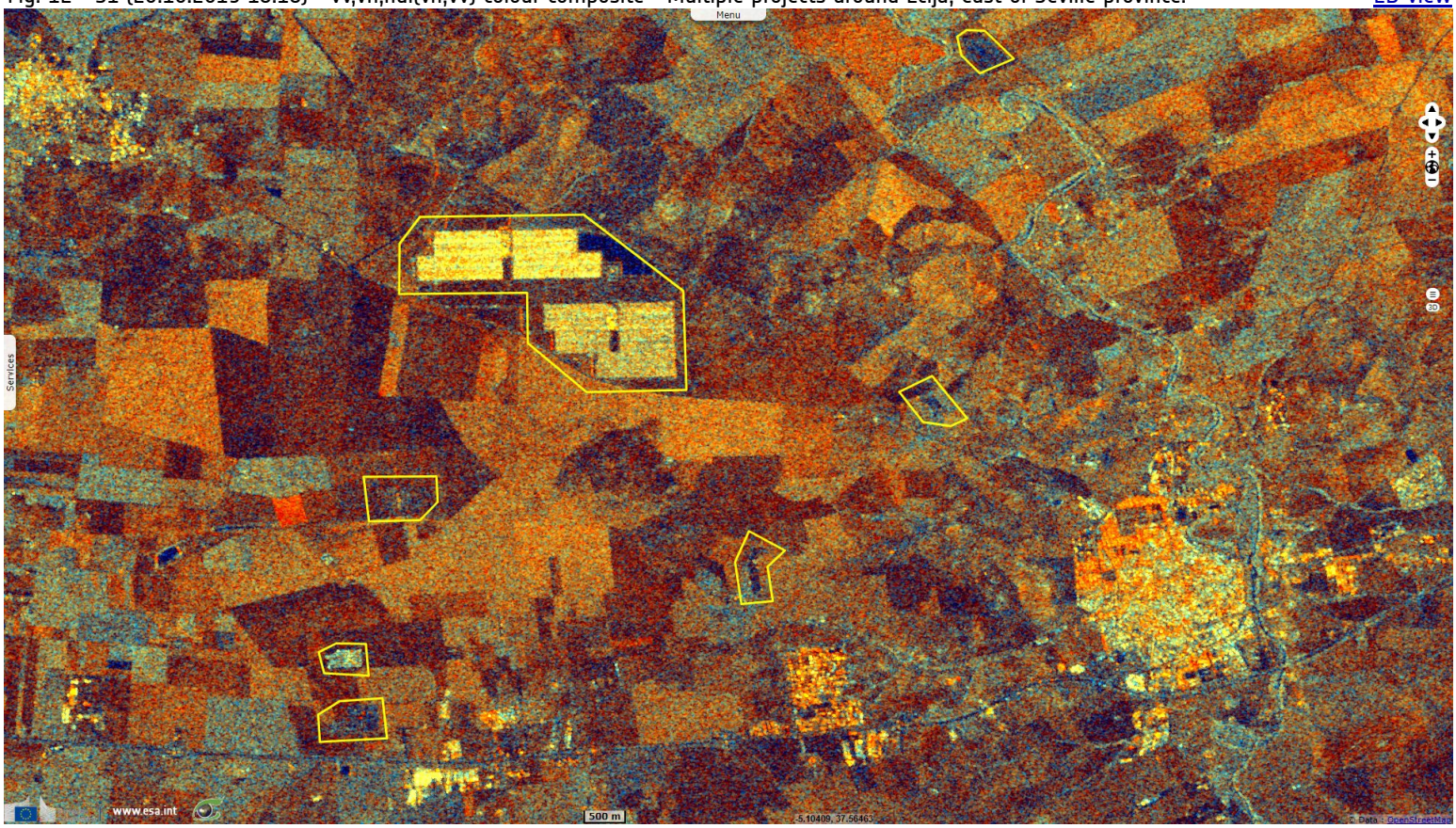
Fig. 11 - S1 (20.10.2019 18:18) - vv,vh,vv colour composite - La Africana & El Molino 2D view



"Thanks to the new technology used in this plant, the park increases the performance of its 39,000 solar panels by around 35%, since it makes better use of the sun's hours."

"*The plant has an innovative technology consisting of polycrystalline silicon modules on two-axis mobile structure*" - source: Magtel

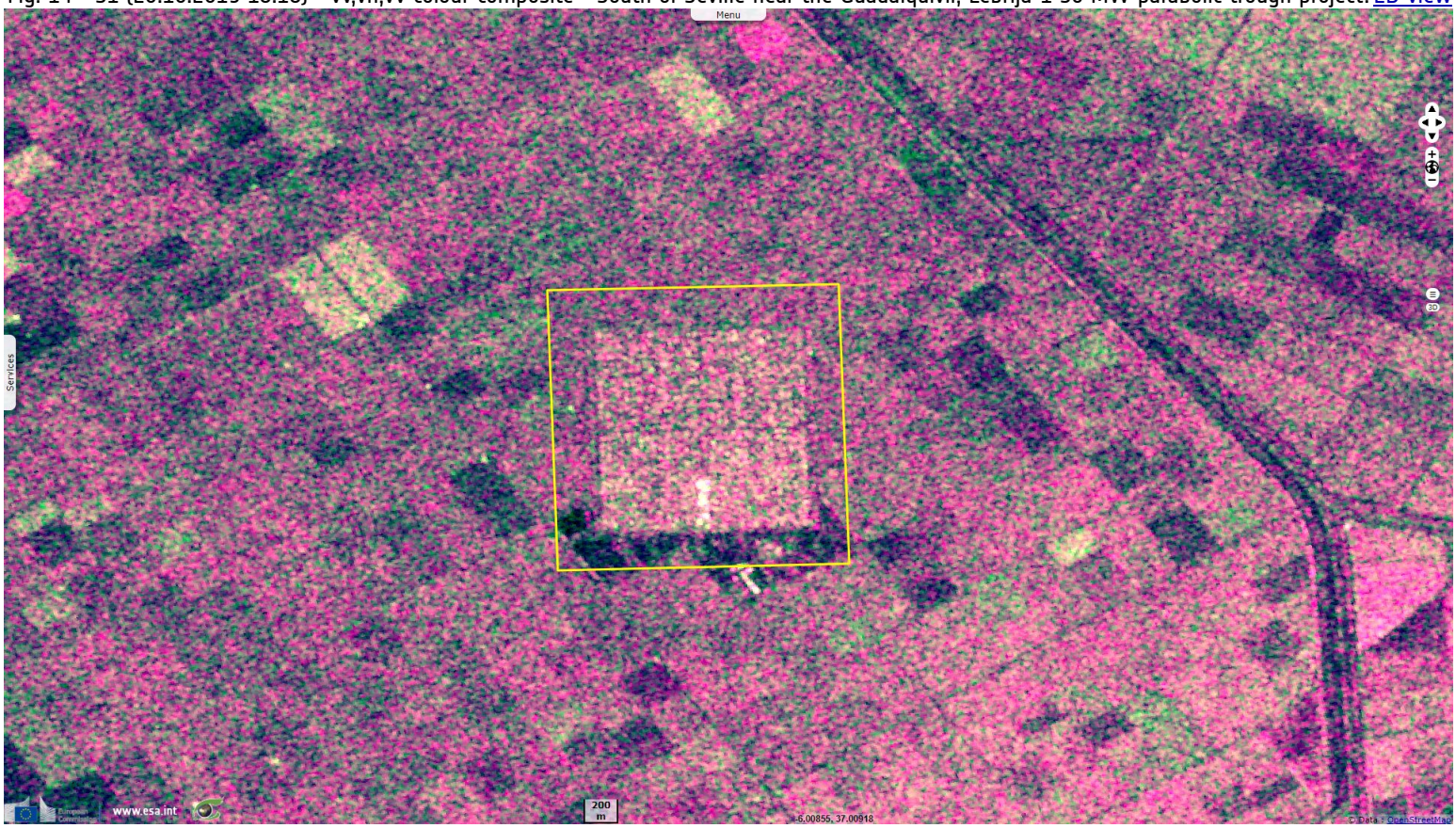
Fig. 12 - S1 (20.10.2019 18:18) - vv,vh,ndi(vh,vv) colour composite - Multiple projects around Ecija, east of Seville province. 2D view



Écija is known in Spain as La sartén de Andalucía, "The Frying Pan of Andalusia".

Fig. 13 - S2 (11.06.2019) - 4,3,2 natural colour - Two 50 MW parabolic trough projects in Morón de la Frontera Aranales 3D view

Fig. 14 - S1 (20.10.2019 18:18) - vv,vh,vv colour composite - South of Seville near the Guadalquivir, Lebrija-1 50 MW parabolic trough project. 2D view



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