



EGNOS, it's there. Use it.

# GNSS and EGNOS for farming: all you need to know from this European free service

ESSP-MEMO-24322



European  
Global Navigation  
Satellite Systems  
Agency



Precise navigation,  
powered by Europe



# Table of contents

- Overview of EGNOS system and services
- EGNOS performance
- Benefits of EGNOS in agriculture
- EGNOS configuration in agricultural equipment
- EGNOS user support

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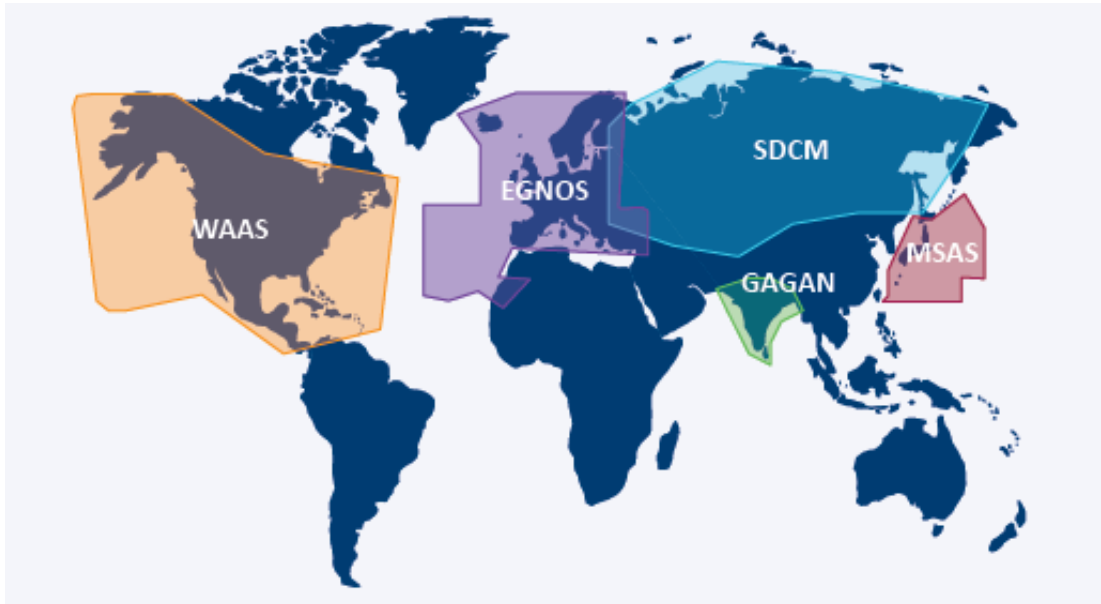
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# EGNOS background

**EGNOS** (European Geostationary Navigation Overlay Service) is the **free** European satellite-based augmentation system (SBAS) over the L1 signal of GPS

**EGNOS** was designed for aviation purposes, complying with the requirements of the International Civil Aviation Organization (ICAO)

**EGNOS** is interoperable with the SBAS systems of other regions (see map below).



**In the future (>2023):**

- **EGNOS** will augment also **Galileo**
- **EGNOS** will broadcast dual-frequency corrections: **L1/E1** and **L5/E5**

# EGNOS system

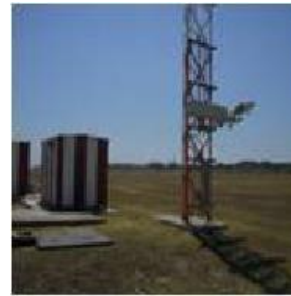
**2 x MCC**

Mission  
Control  
Centres



**40 x RIMS**

Ranging  
& Integrity  
Monitoring  
Stations



GPS signals

**4 x NLES**

Navigation  
Land Earth  
Stations



ESSP premises

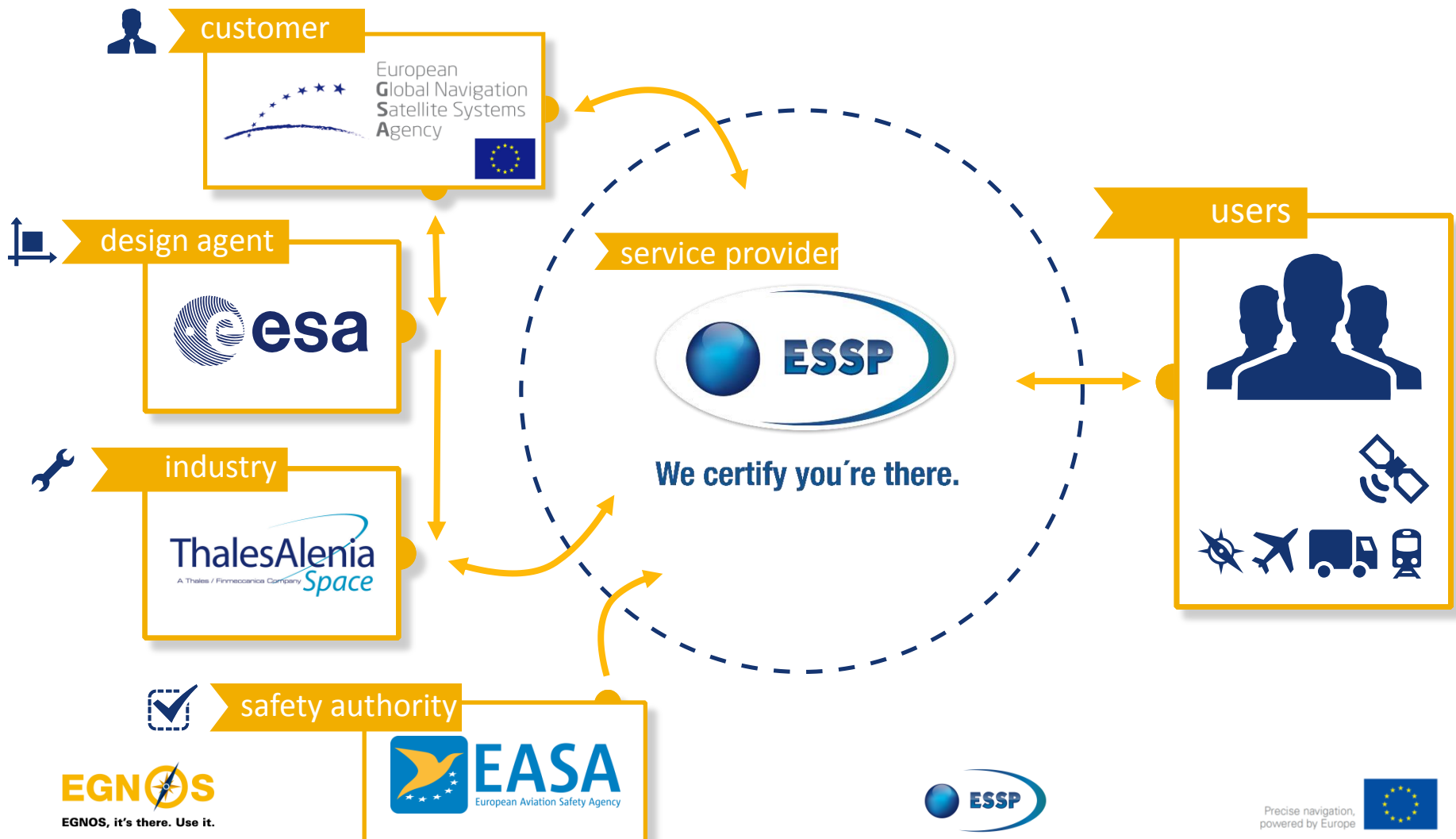
**EGNOS**

EGNOS application area

2 Geostationary Satellites

EGNOS signal in space  
(SiS) coverage footprint

# ESSP within the EGNOS ecosystem



# EGNOS services



**OPEN SERVICE**

**OS Open service**  
targets mass market/general purpose applications enabling a large variety of potential applications by improving the GPS standalone performances.  
The OS service was declared available in October 2009.

- OS service release: **1 October 2009**
- [EGNOS OS Service Definition Document \(SDD\)](#)
- Agriculture, maritime, road, train, GIS/mapping, location based services (LBS)...
- No regulatory framework



**SAFETY OF LIFE**

**SoL Safety of Life**  
Provides the most stringent level of signal-in-space performance for all Safety of Life user communities in Europe, particularly defined for aviation.  
The EGNOS SoL Service is available since March 2011.

- SoL service release: **2 March 2011**
- [EGNOS SoL Service Definition Document \(SDD\)](#)
- Regulatory framework that obliges to use certified EGNOS equipment
- Aviation: LPV landing approaches without ground infrastructure



**EDAS**

**Data Access**  
The EGNOS Data Access Service (EDAS): the ground based access (through the Internet) to EGNOS data in real time and also through a historical archive, which collects all the data generated by the EGNOS Infrastructure. The EDAS service was declared in July 2012.

- EDAS service release: **26 July 2012**
- [EDAS Service Definition Document \(SDD\)](#)
- Provision of EGNOS/GPS/GLONASS data through the Internet
- DGNSS and RTK corrections in the surroundings of the RIMS

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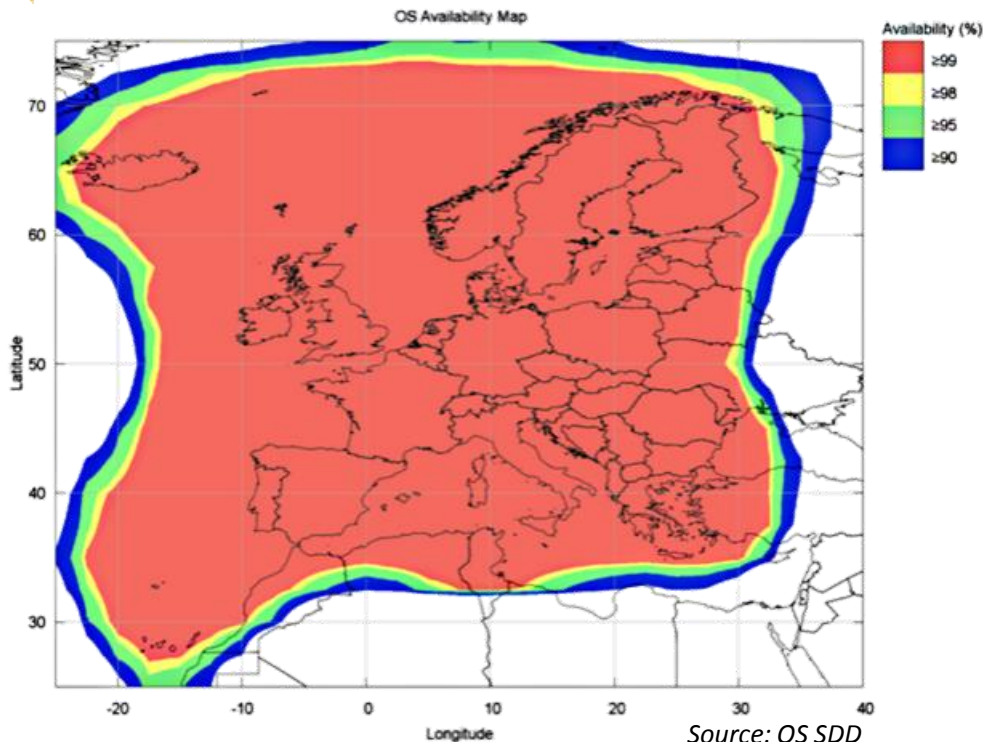
- Overview of EGNOS system and services
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# EGNOS accuracy (1/2)

## EGNOS Open Service application area

Figure 6.1 EGNOS OS compliance area



### Measured values

RIMS	HNSE 95%	VNSE 95%
Aalborg	0.6 m	1.5 m
Berlin	0.7 m	1.2 m
Málaga	0.8 m	1.0 m
...	...	...

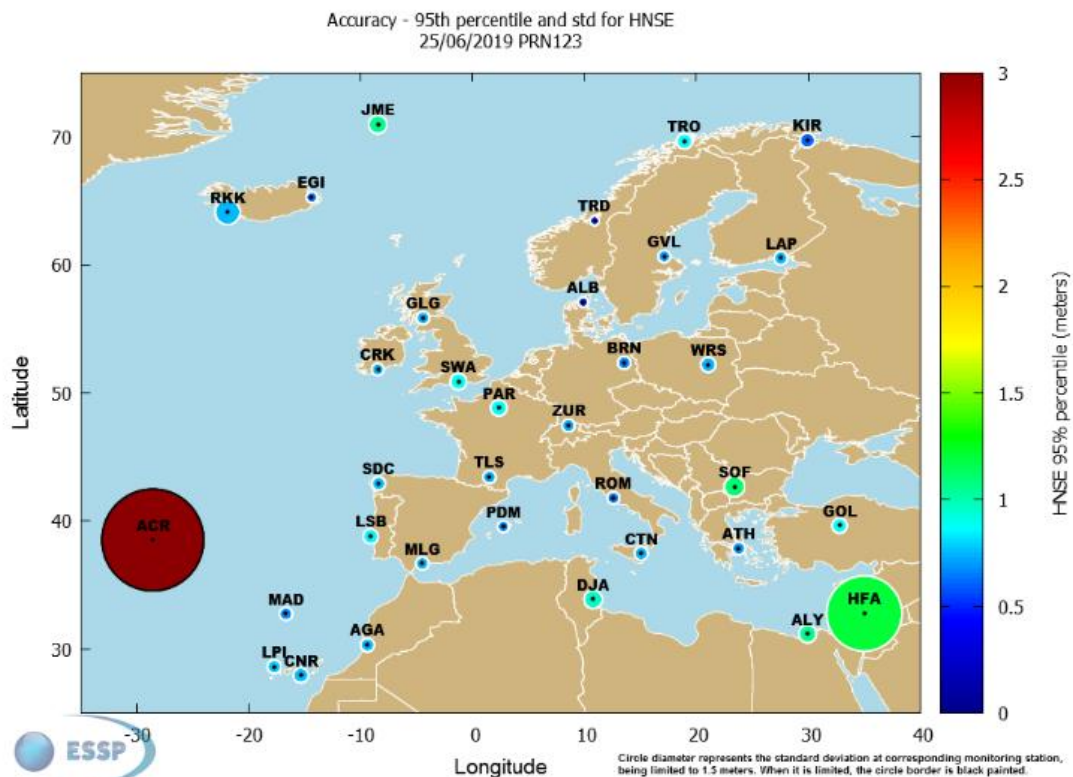
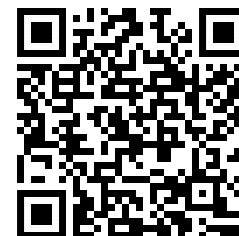
May 2019 ([monthly reports](#))



# EGNOS accuracy (2/2)

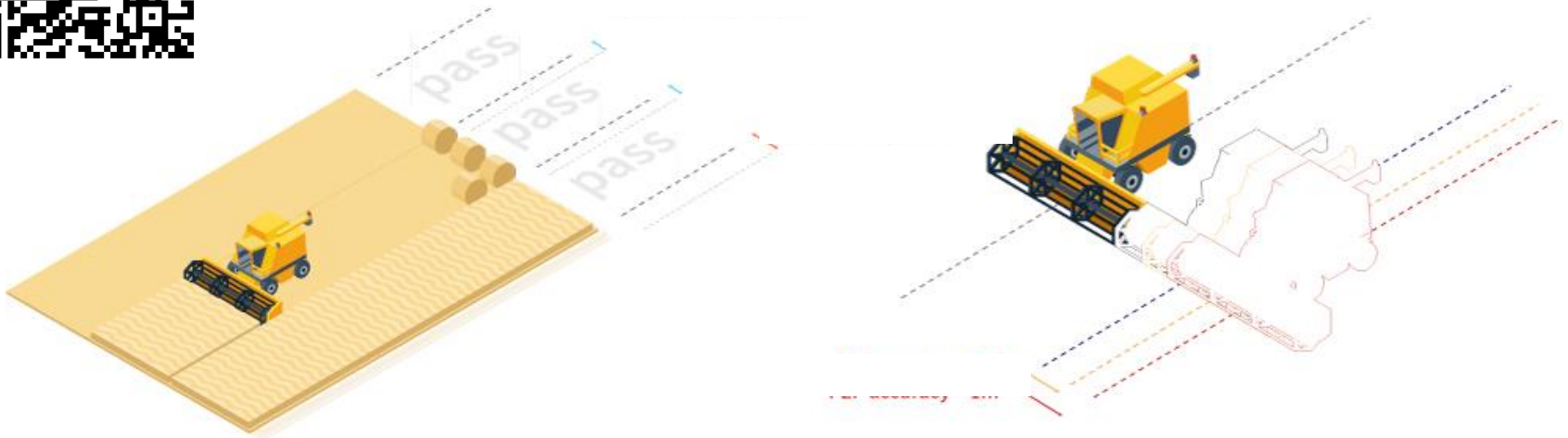
## 2. Measured performance:

EGNOS accuracy (95% confidence bound) is measured [daily](#)



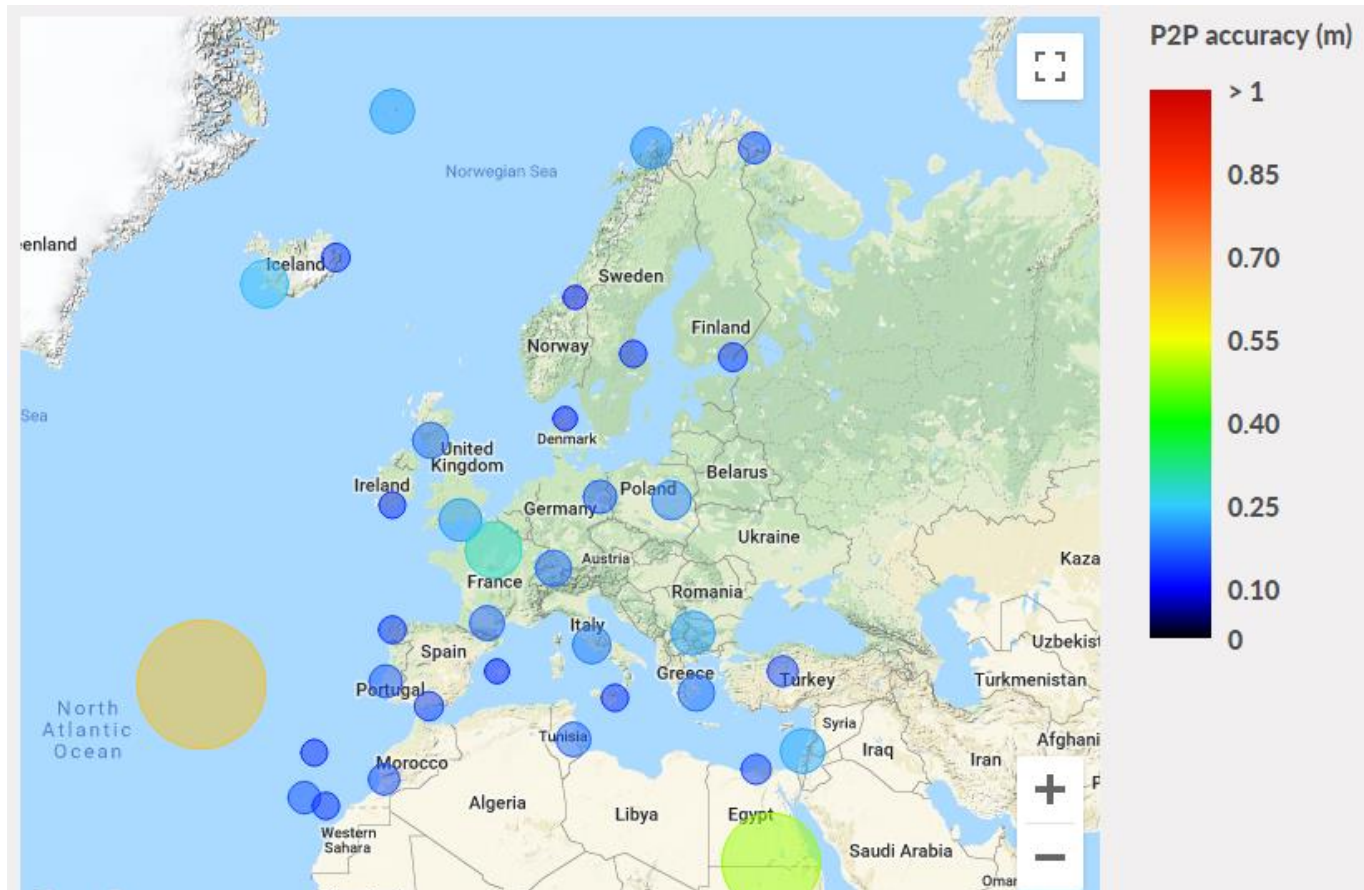
The actual errors are significantly lower than the aforementioned specifications:  
**submetre accuracy**  
(measured with 95% confidence level)

# EGNOS accuracy for agriculture: Pass to Pass ( 1/2)



**Pass2Pass accuracy monitored every day and available in this link**  
[https://egnos-user-support.essp-sas.eu/new\\_egnos\\_ops/pass\\_to\\_pass](https://egnos-user-support.essp-sas.eu/new_egnos_ops/pass_to_pass)

# EGNOS accuracy for agriculture: Pass to Pass (2/2)



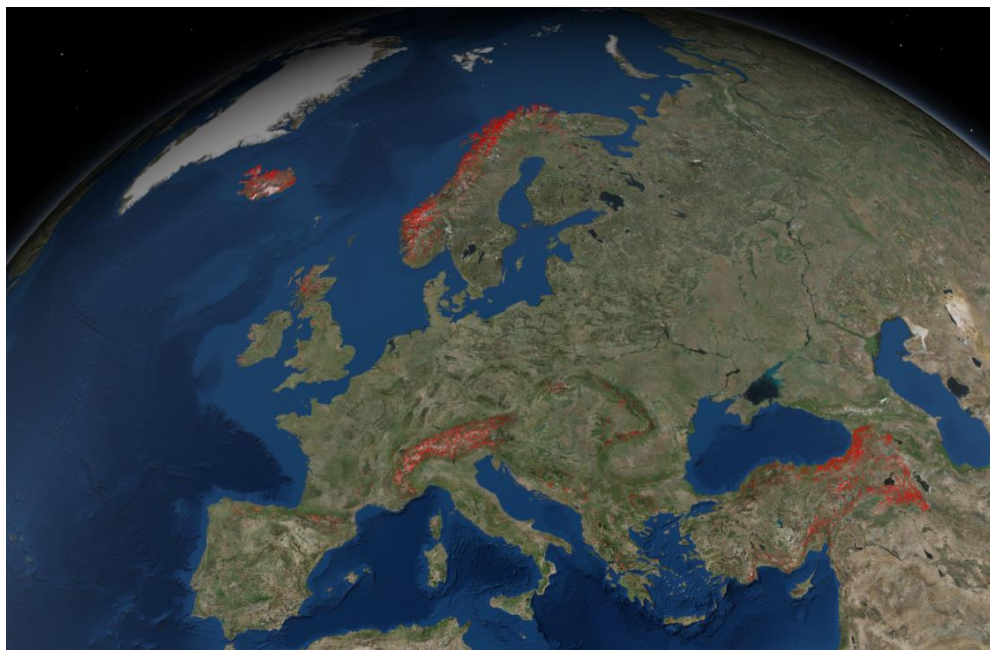
**EGNOS  
Pass2Pass  
accuracy is  
~20-30 cm**

**Recent  
publication  
testing EGNOS  
performance  
(~13 cm)**



# EGNOS visibility maps (1/2)

EGNOS is available over all Europe, but the terrain orography could affect the visibility of EGNOS satellites. **Visibility maps are provided in the EGNOS User Support Website**



[https://egnos-user-support.essp-sas.eu/new\\_egnos\\_ops/resources-tools/egnos-visibility-maps](https://egnos-user-support.essp-sas.eu/new_egnos_ops/resources-tools/egnos-visibility-maps)

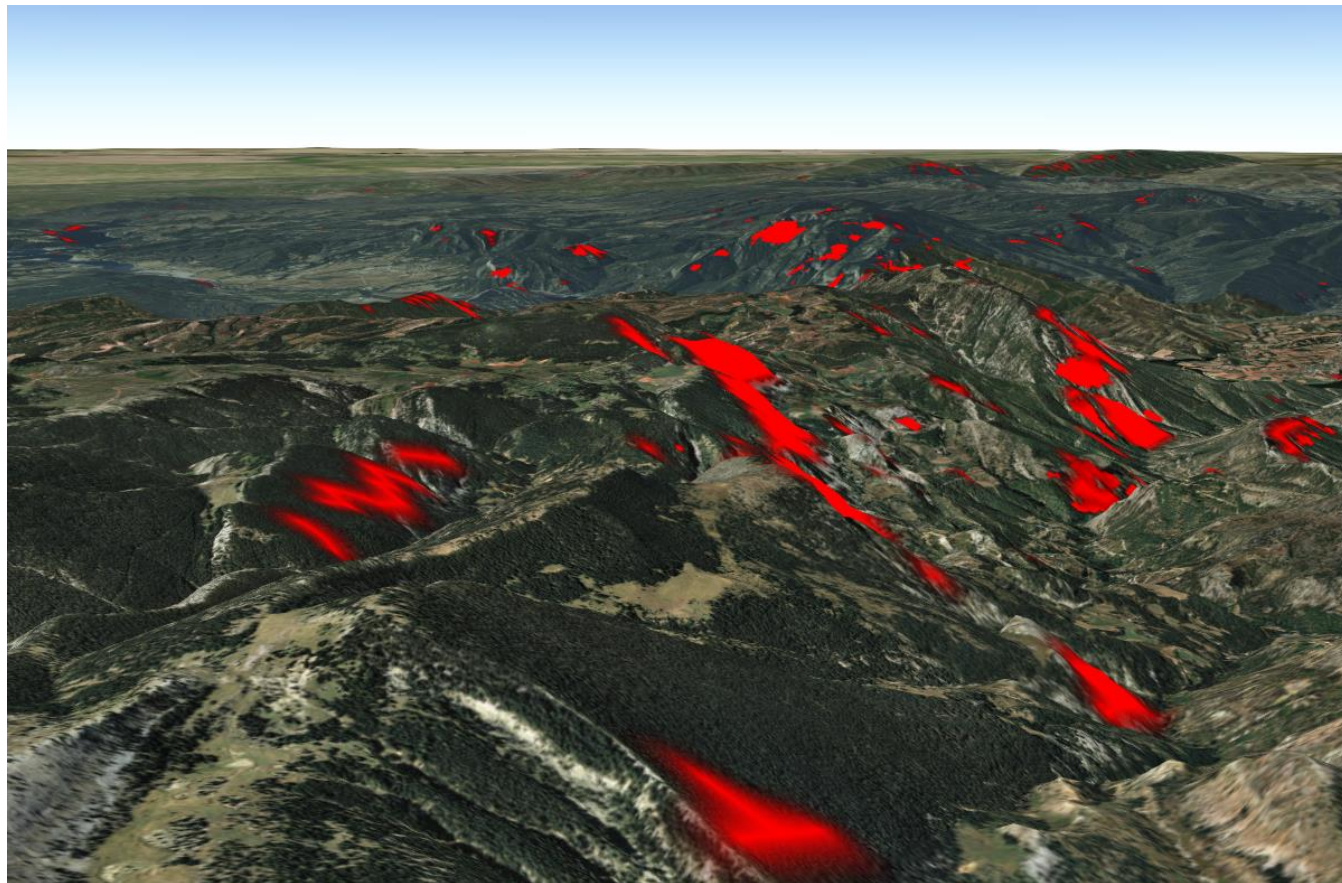


# EGNOS visibility maps (2/2)

Users can find EGNOS “shadow areas”

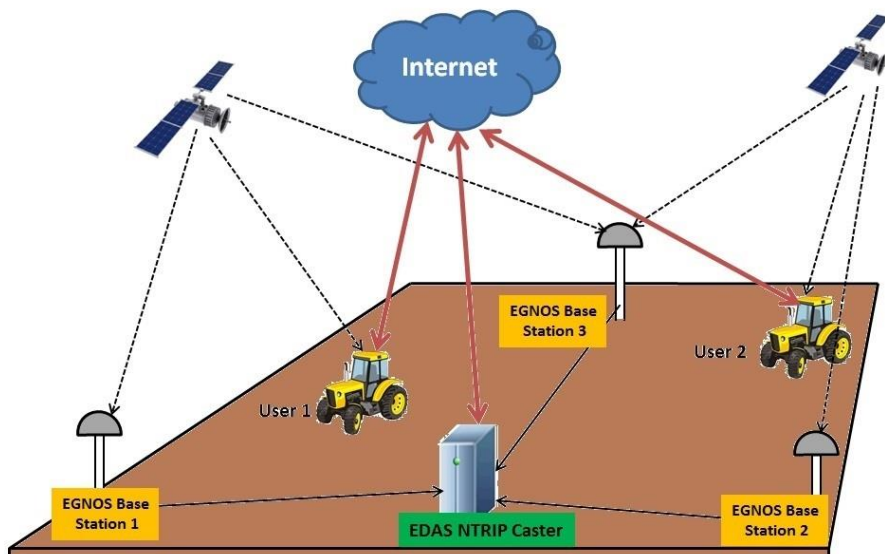
Maps can be zoomed in and out, allowing 3D view.

Possible to select shadow areas for one GEO or for both



# EDAS NTRIP Service

EDAS NTRIP provides through the Internet free DGNSS and RTK corrections in the surroundings of the multiple EGNOS RIMS



A DGNSS and/or RTK receiver compatible with the NTRIP protocol is required (*Note: EDAS Ntrip service based on Ntrip v1.0 over http*)

# EDAS NTRIP application

Farming activities must be carried out close enough to any of the EGNOS reference stations (see map) to achieve the suitable accuracy

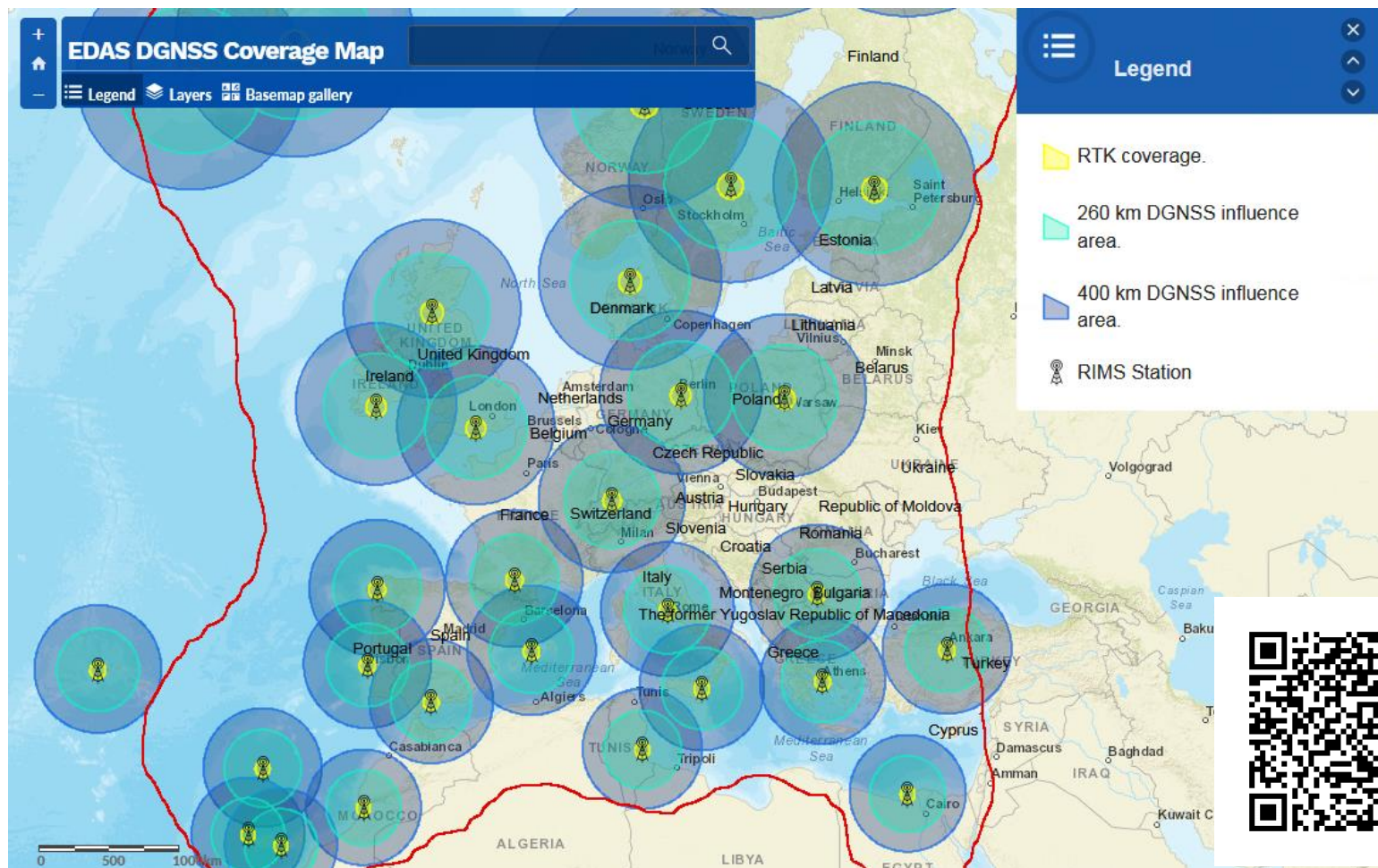
DGNSS corrections	RTCM 2.1 y 2.3	< 260 km
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RTK corrections	RTCM 3.1	< 50 km
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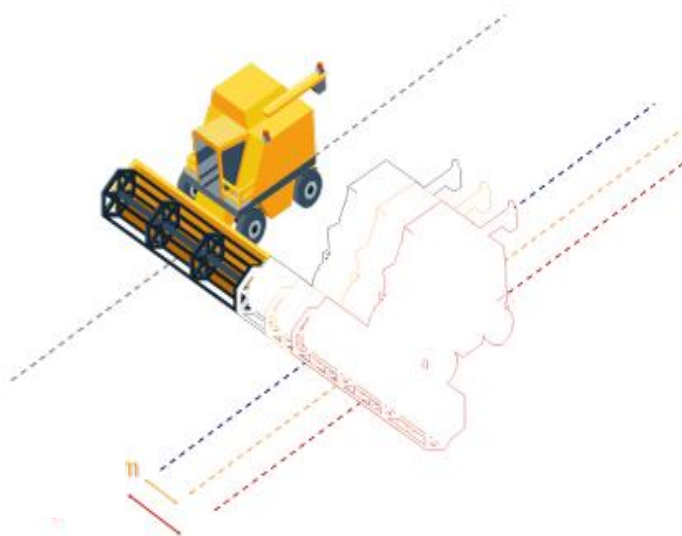
# EDAS RTK and DGPS coverage



# EDAS DGNSS: Pass to Pass results

From 2<sup>nd</sup> July to August 6<sup>th</sup> 2016.

Solutions with horizontal accuracy (percentile 95<sup>th</sup>) < 1 m



Location	Solution	Pass to Pass -15 min. 95th-
La Palma (Spain)	LPALO_LPIA	13,9 cm
La Palma (Spain)	LPALO_CNRA	10,1 cm
Cascais (Portugal)	CASCO_LSBA	15,7 cm
Hofn (Iceland)	HOFNO_ECNA	12,4 cm
Ons (Spain)	ONS10_MLBA	10,1 cm
Medina (Spain)	MELIO_MLGA	11,2 cm
Oberpfaffenhofen (Germany)	OBE40_ZURA	20,6 cm
Borowiec (Poland)	BOR10_BRNA	13,7 cm
Ciboure (France)	SCOA0_TLSA	18,6 cm
Toulouse (France)	TLSE_TLSA	16,5 cm

Pass to pass  $\leq$  20 cm

**Static data, percentile 95th, 15 minutes time window.**

ISO 12188-1, Tractors and machinery for agriculture and forestry-Test procedures for positioning and guidance systems in agriculture-Part1: Dynamic testing of satellite-based positioning devices

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- **Benefits of EGNOS in agriculture**
- EGNOS configuration in agricultural equipment
- EGNOS user support

# EGNOS farming activities

## Farming applications

## Accuracy



Livestock positioning and virtual fencing  
Agricultural stations and sensors



< 5 m



Geo-traceability  
Post harvest pick-up



< 2.5 m



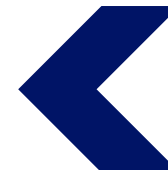
Boundary mapping and updating  
Field measurement



< 1.5 m



Machinery guidance for dry soil crops  
Variable rate application



< 1 m

EGNOS

# Benefits of EGNOS in agriculture

**EGNOS is the basic service for machinery guidance in Europe**

**Almost 80% of farming guidance systems integrate EGNOS (\*)**

(\*) [2015 GNSS Market Report](#)

**EGNOS advantages w.r.t. GPS alone:**

- Enhance accuracy
- Avoid waste of fertilisers and herbicides
- Save time and money
- Reduce fatigue
- Optimize crop yields
- Increase profit margins



**EGNOS advantages w.r.t. other high-accuracy solutions:**

- No subscription fee (w.r.t. commercial services)
- No radio base station (w.r.t. RTK)
- No dependency on GPRS coverage (w.r.t. NTRIP)

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# GPS/SBAS receivers in agriculture

Almost all the GPS agricultural receivers are EGNOS enabled



# Example: TOPCON AGI-4 Receiver



## Model: AGI-4

- EGNOS enabled
- GPS/SBAS receiver integrated in the antenna
- X30 display





# Example: Ag Leader GPS6500 Receiver

***Ag Leader®***

**Model: GPS6500**

- EGNOS enabled
- GPS/SBAS receiver integrated in the antenna
- InCommand display



# Example: Trimble CFX-750 Receiver



## Model: CFX-750

- EGNOS enabled
- GPS/SBAS receiver integrated in the display



# Example: John Deere SF 3000



## Model: SF 3000

- EGNOS OS enabled
- GPS/SBAS receiver integrated in the antenna
- Greenstar 3 display



# Guide how-to configure (some) EGNOS enabled receivers

There is a free guide ( English) to explain how to configure EGNOS in the above mentioned equipment.

Download it and use it!



# Why should a farmer use EGNOS?

**EASE (Egnos sAvingS in agriculturE)** is a **free tool** that allows to perform **cost-benefit analyses** on the introduction of EGNOS for machinery guidance in some of their typical agricultural labours.



**GEAR : ( eGnos dEmonstrator for agRiculture)**

Visit EGNOS stand and try it!

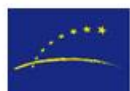
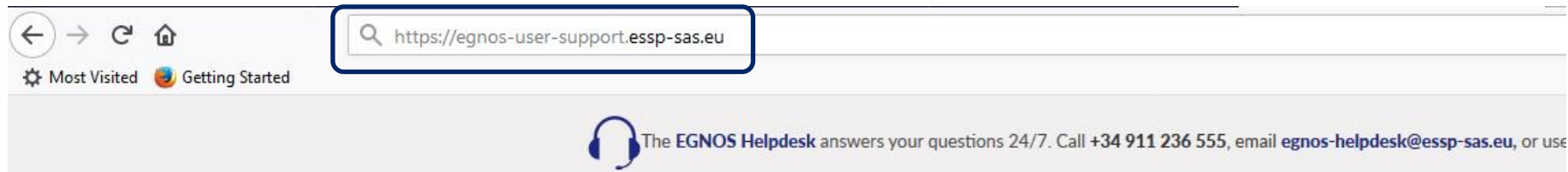
You can download it for **free**



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# EGNOS User Support Website



European  
Global Navigation  
Satellite Systems  
Agency

[HOME](#) [HELPDESK](#)

[EUROPEAN GNSS](#)

[EGNOS SYSTEM](#)

[SERVICES](#)

[NEWS & EVENTS](#)

[DOCUMENTS](#)

[RESOURCES & TOOLS](#)

**EGNOS**  
User Support



**3rd Call for EGNOS  
adoption in aviation,  
want to be part of it?**

**THE 3RD AVIATION CALL IS  
DEADLINE: 21 MAY 2018**

**AVIA**

**EGNOS**  
EGNOS, it's there. Use it.



European  
Global Navigation  
Satellite Systems  
Agency

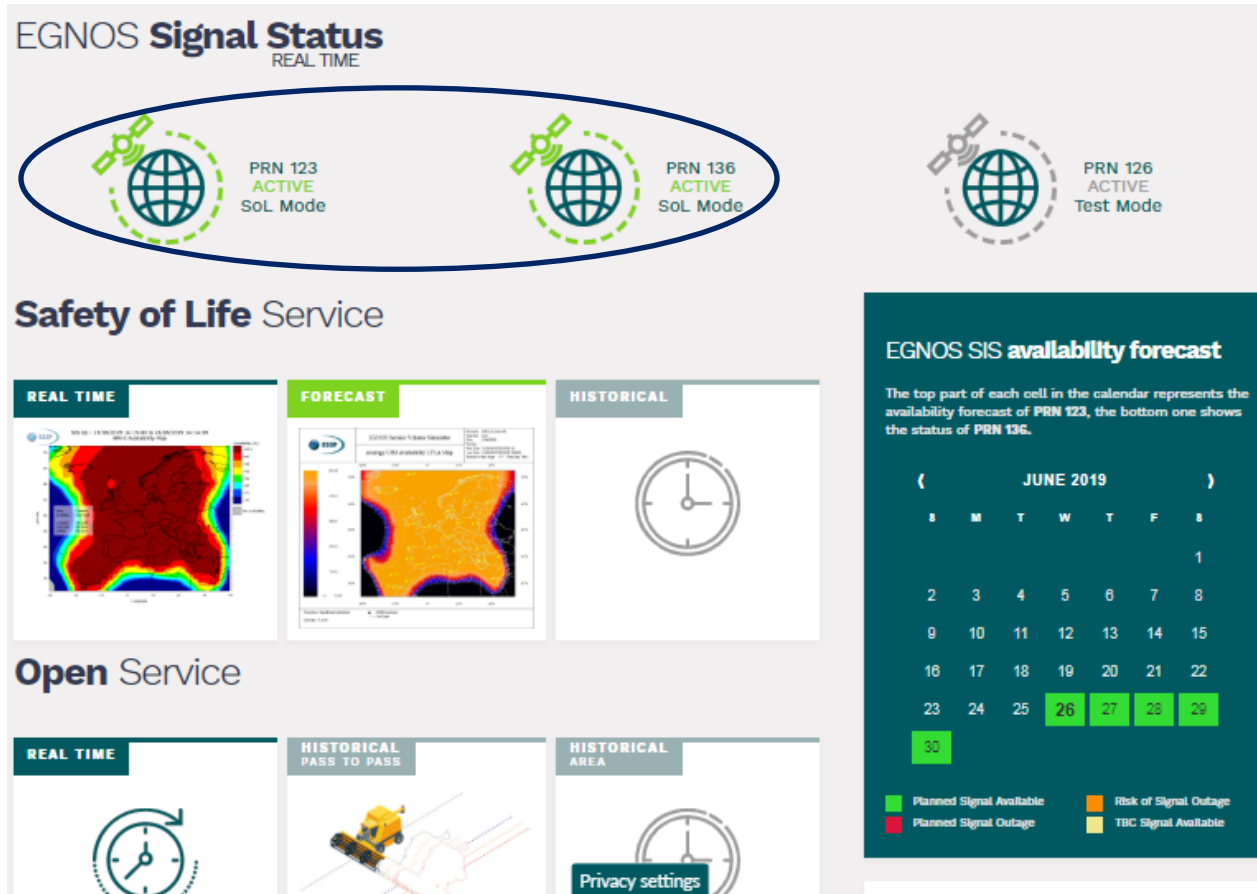


Precise navigation,  
powered by Europe






# EGNOS satellites availability







# EGNOS adoption material



European  
Global Navigation  
Satellite Systems  
Agency

HOMEHELPDESKLOGINREGISTER

EUROPEAN GNSSEGNOS SYSTEMSERVICESNEWS & EVENTSDOCUMENTSRESOURCES & TOOLS



HOME » RESOURCES & TOOLS » GUIDANCE MATERIALS

≡ EBCAST TOOL

≡ LPV PROCEDURES MAP

≡ COMPANIES CATALOGUE

≡ GUIDANCE MATERIALS

≡ TRAINING MATERIAL

≡ EGNOS USER SATISFACTION

≡ BROCHURES

## GUIDANCE MATERIAL

The following documents provide simple guidelines for aviation stakeholders within the European Civil Aviation Conference (ECAC) area to facilitate the operational implementation of Localizer Performance with Vertical guidance (LPV) operations. Together with specific analyses on applicable regulations, Air Navigation Service Providers (ANSPs) and Airport Operators shall find LPV approach implementation guidelines including LPV-200 aspects, while Aircraft Operators shall find practical hints to obtain operational approval by their national authorities to perform LPV operations.

- EGNOS How to become compliant with EU requirements for LPV
- LPV Implementation Guidelines Airports Operators



Farmers and agricultural users with EGNOS enabled devices can use this material to check how to configure EGNOS Geostationary satellites in their equipment.

- How to configure agriculture EGNOS receivers

Mapping and Surveying users with EGNOS enabled devices can use this material to check how to configure EGNOS Geostationary satellites in their equipment.

- How to configure EGNOS receivers

# EGNOS Pass to Pass accuracy



HOME » PASS TO PASS

SoL SAFETY of LIFE SERVICE

OS Open Service

PRECISION DEVIATION (Realtime)

HISTORICAL PERFORMANCE

GPS vs GPS/EGNOS

POSITION ERROR

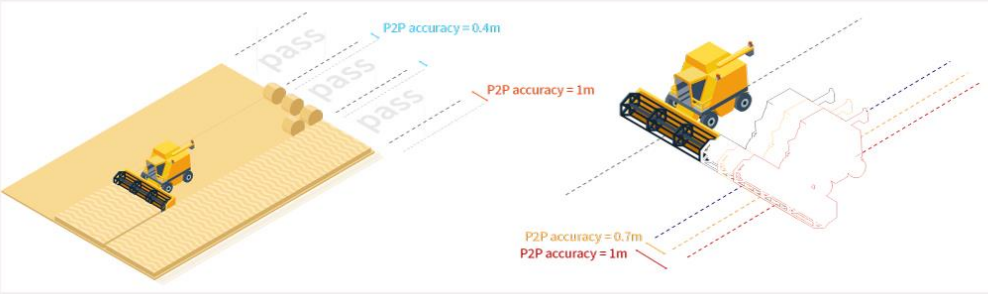
PASS TO PASS

EDAS EDAS SERVICE


## PASS TO PASS

Pass to Pass accuracy is the term used by farmers to describe their user needs in relation with accuracy; and the term used by GNSS manufacturers to describe the accuracy the equipment can provide. Pass-to-pass accuracy is defined as the accuracy which can be achieved over a 15 minute window, being 15min the approximate time to make a pass in a typical field. **Standard ISO 12188** describes in detail how to compute this quantity.

Figure below, explains graphically the concept. Once you have done a pass in the field with the tractor, and you return and place it in the same position according to your GNSS equipment, you are not exactly in the same place, there is a bias. This bias is the so called "pass-to-pass" accuracy. To see Pass-to-Pass accuracy provided by EGNOS, select a date and a RIMS station. Note this pass-to-pass accuracy is available in all EGNOS Service Area (not just only in the RIMS station).

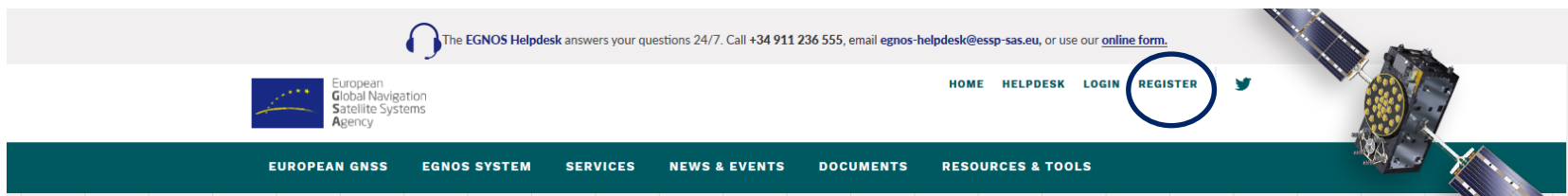


Select date \*  
  
View



# Registration and notification subscription

## 1. Registration in the EGNOS user support website (top right)



## 2. Interesting subscriptions to be selected during registration

**Aviation-related  
(of no interest  
for agriculture)**

**Step 4 of 4 Notifications Subscriptions**

The subscription to the EGNOS Notifications Service enables the reception of different EGNOS degradations notifications via e-mail.

**EGNOS System Notifications**

☐ SIS Outages Notifications

**~~Notifications for Aviation users~~**

☐ APV-I Availability Degradation Notifications  
Reporting by e-mail when the daily 99% APV-I availability is covering less than 80% of the APV-I service area as described in the applicable EGNOS SoL Service Definition Document (SDD). The notifications are sent when planned degradations are foreseen or when unplanned degradations occur.

☐ LPV-200 Availability Degradation Notifications  
Reporting by e-mail when the daily 99% LPV-200 availability is covering less than 80% of the LPV-200 service area as described in the applicable EGNOS SoL Service Definition Document (SDD). The notifications are sent when planned degradations are foreseen or when unplanned degradations occur.

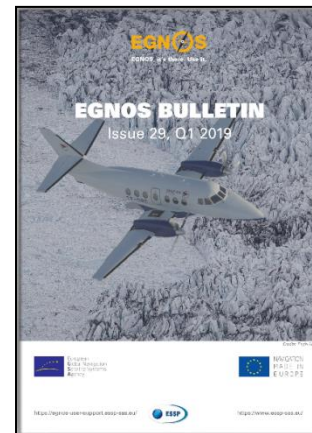
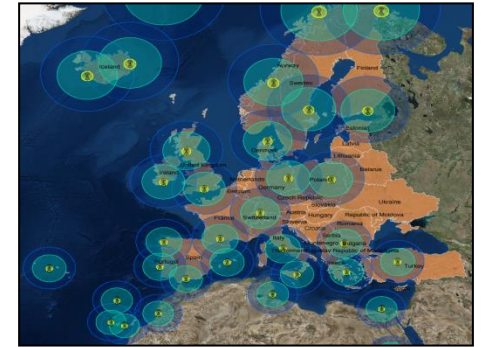
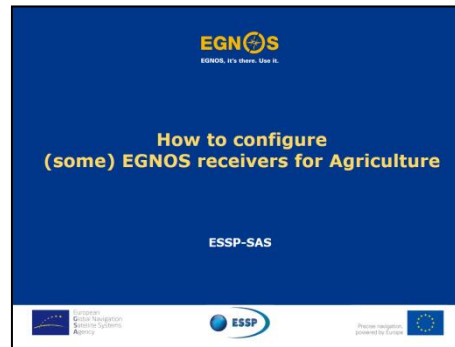
**Open Service Notifications (for Maritime, Rail, Agriculture, Road, LBS and surveying & Mapping users)**

☐ Open Service Availability Degradation Notifications  
Reporting by e-mail when the daily OS availability is lower than 99% for more than 50% of the RIMS inside the EGNOS OS Service Definition Document (SDD). The notifications are sent when planned degradations are foreseen or when unplanned degradations occur.

# EGNOS links for farming

EGNOS User Support Website: <http://egnos-user-support.essp-sas.eu>

- [Service Notices \(e.g. PRN modifications\)](#)
- Real-time performance:
  - [EGNOS vs GPS](#)
  - [EDAS](#)
- [Pass to Pass accuracy](#)
- [Guidance material](#)
- [EASE tool](#)
- [EDAS coverage maps](#)
- [EGNOS bulletin](#)
- [EGNOS helpdesk](#)



# EGNOS mobile app

Freely available for **Android** and **iOS**

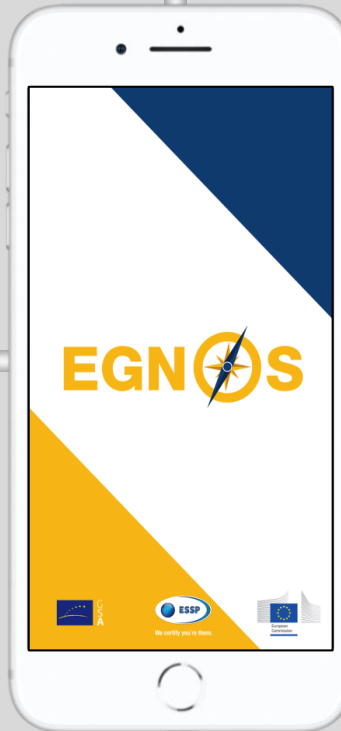


## EGNOS Helpdesk

Accessible from the app



**Docs and tools**  
Browse official documents & tools



## Signal in Space

EGNOS system information



**EGNOS performance**  
SoL, EDAS, OS services







# EGNOS ANNUAL WORKSHOP

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ROME, ITALY  
24-25 SEPTEMBER, 2019



USA



Trust, from space to cockpit,  
for one clever sky.



NAVIGATION  
MADE IN  
EUROPE



EGNOS, it's there. Use it.



[www.essp-sas.eu](http://www.essp-sas.eu)



<http://egnos-user-support.essp-sas.eu>



[sofia.cilla@essp-sas.eu](mailto:sofia.cilla@essp-sas.eu)

[egnos-helpdesk@essp-sas.eu](mailto:egnos-helpdesk@essp-sas.eu)

+34 911 236 555 (H24/7)



Corporate Video

**THANK YOU FOR YOUR ATTENTION**