

# Positionnement fiable et précis par satellites de radio-navigation

**Geoflex**

Hypergeolocation everywhere  
A cloud service for everyone

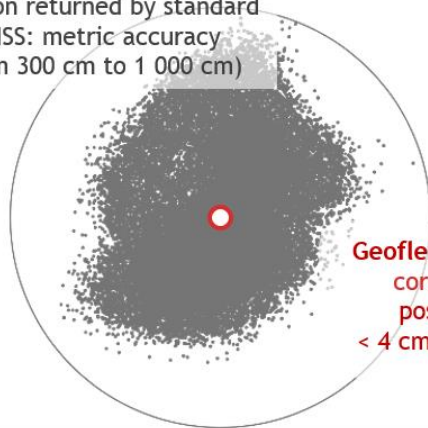


## For a better positioning, making the best of your current satellites data

  
Hypergeolocation for a better life

- From a few meters down to a few centimeters: 2 orders of magnitude
- In real time or in post-processing
- Everywhere in the world, on land, at sea, and in the air
- Designed for integrators (API, SDK, HDK, Standard formats etc.)

Position returned by standard  
GNSS: metric accuracy  
(from 300 cm to 1 000 cm)



Geoflex solution  
corrected  
position:  
< 4 cm accuracy



CENTRE NATIONAL D'ÉTUDES SPATIALES



Simple, Accurate, Robust,  
Everywhere, Cost effective

Exclusive rights on **7** patents on a technology  
developed for **12+** years by CNES

Geoflex team involved in Global  
Navigation Satellite System  
augmentations for **20+** years

## The only scalable solution already streaming worldwide fully normalized corrections

### Less is More

Simple = Reliable and Certifiable

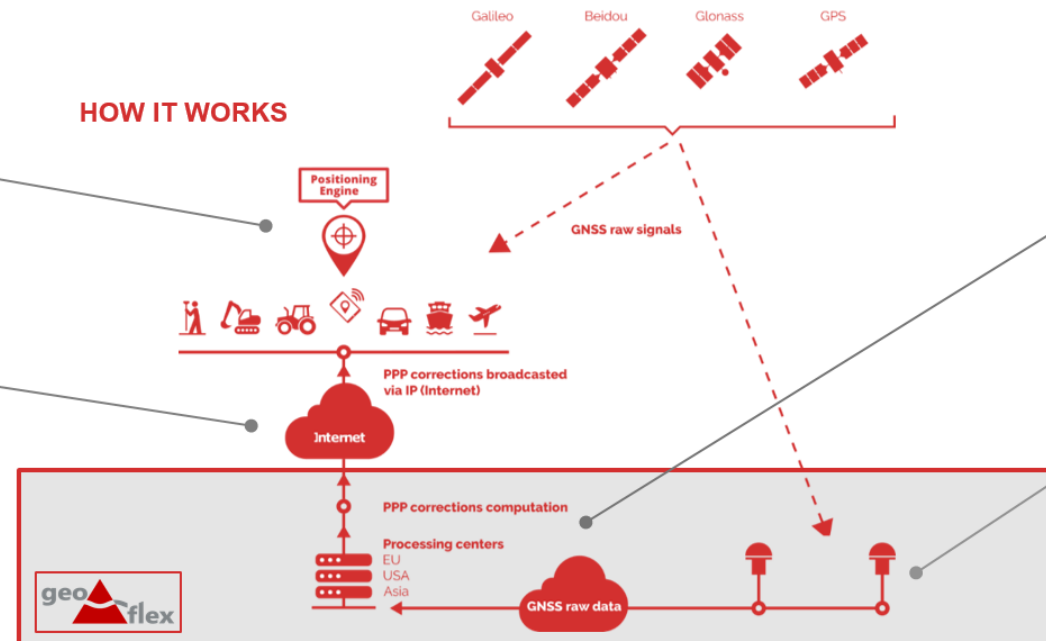
- The only low cost and scalable system already able to face mass markets requirements everywhere in the world
- Very simple & reliable to pave the way of certification processes
- Service already fully operational worldwide
- A protected central intelligence in SaaS mode

**1. Precise and reliable Position, Velocity & Time estimation** by synchronizing the PPP corrections with the GNSS measurements

**2. A very simple, fully normalized, low frequency and light data stream, broadcasted via internet** to an unlimited number of GNSS devices (same errors for all users).



### HOW IT WORKS



**3. Software running in distributed and fully redundant processing centers** that compute the GNSS satellites dependent PPP corrections.

**4. Geoflex GNSS permanent stations:** An existing infrastructure made of only 80 ground stations covering the whole globe and sending their observations to the Cloud.

## Global Recognition and Business Progress in 2019 & 2020

### CES LAS VEGAS

January 2019

Innovation Award  
in the "Vehicle  
Intelligence and  
Self-Driving  
Technology"  
category



### SNCF

September 2019

LOC4RAIL: Geoflex  
selected with iXblue  
by SNCF to  
dematerialize the rail  
signing for a better  
railway system



### Dubai World Challenge

October 2019

Dubai World Challenge  
for Self-Driving  
Transport: Geoflex in  
one of the 2 awarded  
teams (Bolloré /  
Gaussin / AKKA /  
Geoflex)



تحدى دبي العالمي  
للتفكير ذاتي القيادة  
DUBAI WORLD CHALLENGE  
FOR SELF-DRIVING TRANSPORT  
2018 | 2019

### RENAULT

December 2019

Integration  
roadmap with  
RENAULT to  
design better  
ADAS L2/L3



### Orange & Airbus

January 2020

Global Cloud  
platform to mixt  
High resolution  
and fresh space  
based imagery  
with our High  
resolution GNSS





## Global Recognition and Business Progress in 2021

### SPRING50 Paris-Saclay

May 2021

SPRING 50 Award, a competition of Deeptech startups of the Paris-Saclay ecosystem, the largest French Research and startup Cluster



### TotalEnergies

June 2021

Design and realization for TotalEnergies of a Rig Oil monitoring system with a centimeter real time accuracy and a near real time millimeter accuracy



### ASECNA & Thales

July 2021

Demonstration provisioning of the African SBAS PPP service with Thales Alenia Space for the ASECNA to achieve centimeters positioning accuracy across the entire African continent with corrections dissemination via L-Band to simplify architecture



## Global Recognition and Business Progress in 2021

### Zhongguancun Rail Competition

October 2021

“Best Potential Award” at the Zhongguancun Rail Transit International Innovation and Entrepreneurship Competition which aim to identify the best innovative companies for settlement on a new business campus in Beijing dedicated to change the Chinese railway ecosystem.



### CES LAS VEGAS

October 2021

Innovation Award in the “Vehicle Intelligence and Self-Driving Technology” category for our “Safe PPP” global architecture



### Software République

October 2021

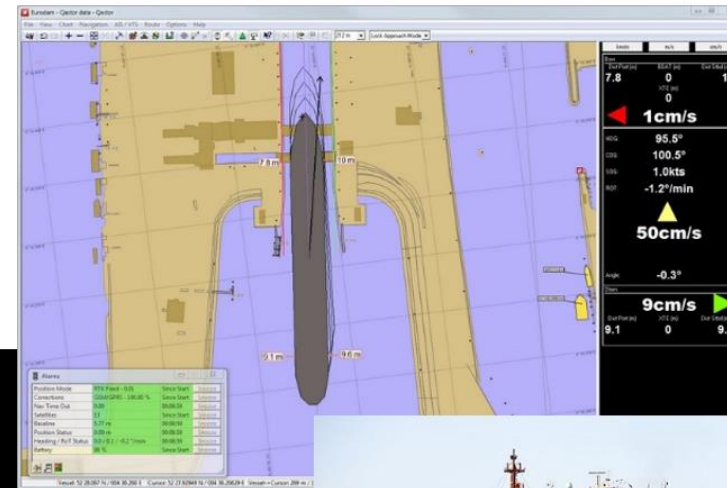
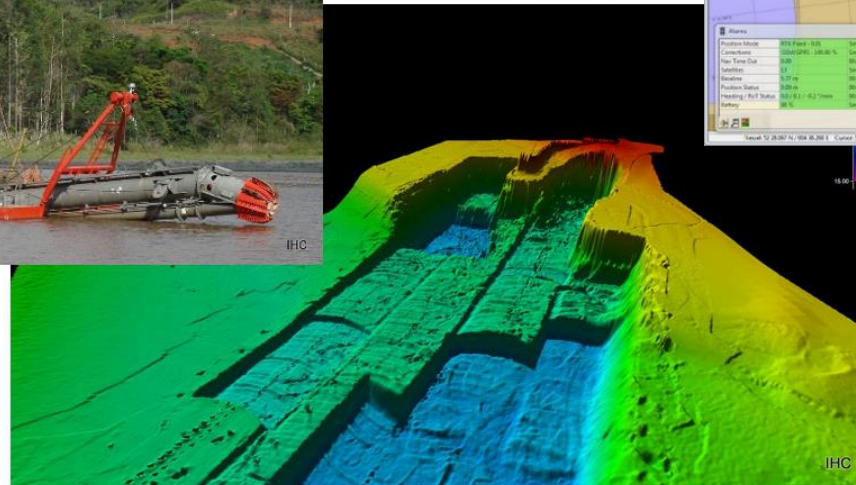
Top 10 company of the challenge “Mobility 4.0” to collaborate with Renault, Atos, Thalès and STMicroelectronics to design and sell new disruptive mobility solutions



## Diversified and very important markets

### **MARITIME AND FLUVIAL:** 4D/4.5D GIS as support for field activities automatization

- Dredging
- Navigation and docking
- Dynamic positioning

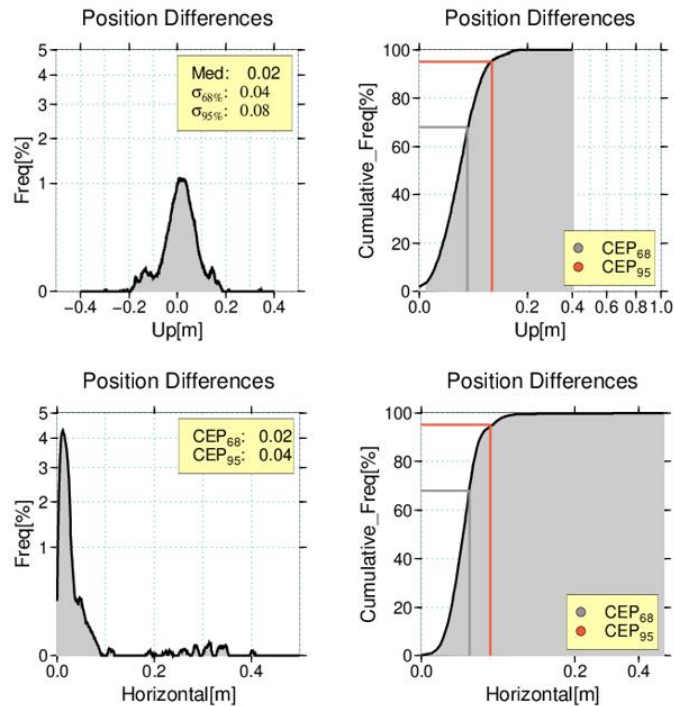




## What we have already done

### MARINE

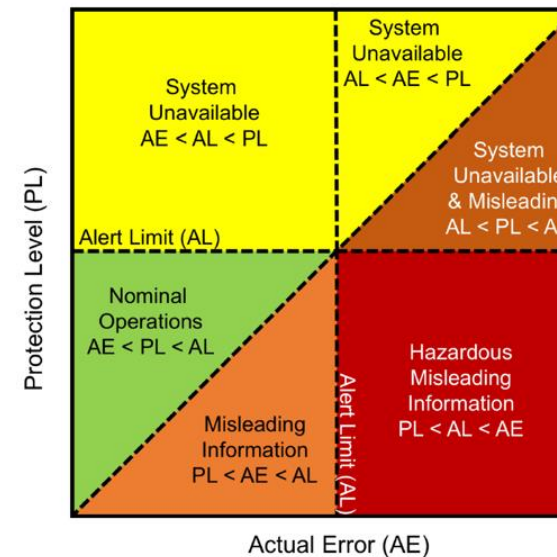
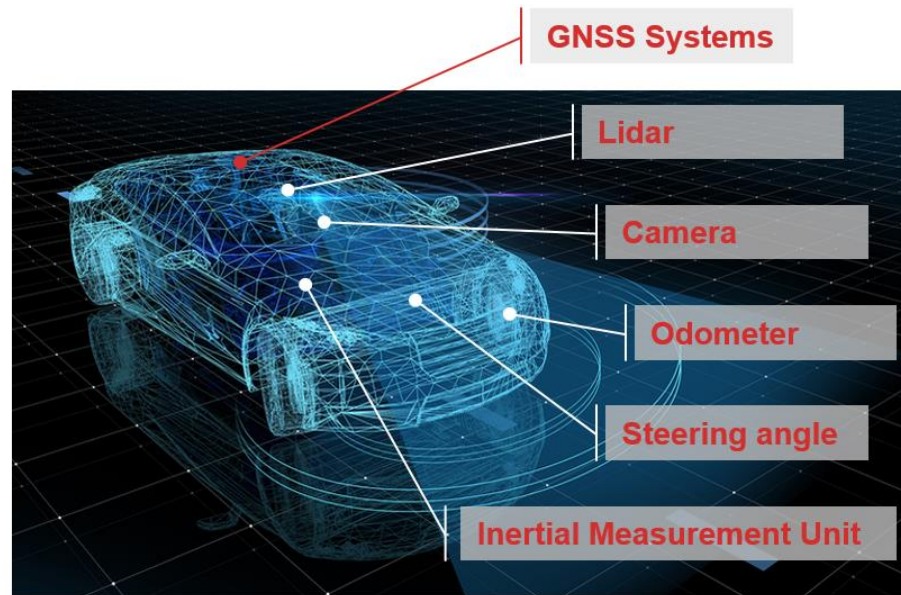
- Service Hydrographique et Océanographique de la Marine (SHOM): Borda Vessel: Comparison to state of the art NPPK (Network Post-Processing Kinematic)





## Geoflex enables safe operations

### Advanced Driver Assistant System & Autonomous Driving (AV - L3 to L5)



Protection level computation to ensure the confidence of the positioning to reach ASIL-B/C (TIR =  $10^{-7}/h$ ) certification compliant with ISO-26262

GNSS system is an « absolute » location sensor correcting off-sets of other sensors.

Geoflex GNSS-PPP positioning is the sensor of the car providing redundancy to the other sensors for higher performances and safety of positioning

## What we have already done

### ROAD MOBILITIES:

- 2019: Groupe Renault: Tight hybridization with the onboard top wheel odometry sensor to pass under bridges with an high rate positioning (compatible with mass-market ADAS applications)



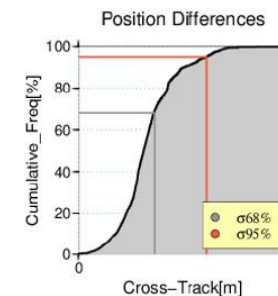
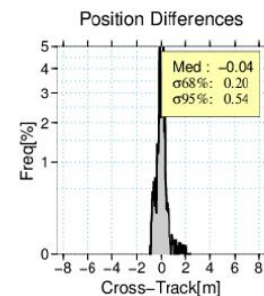
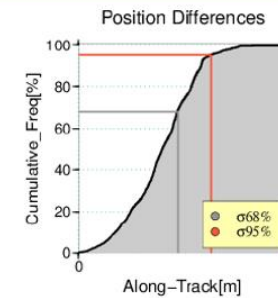
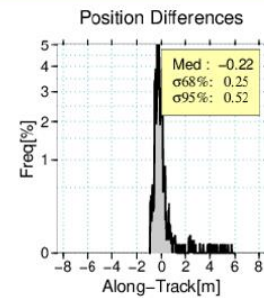
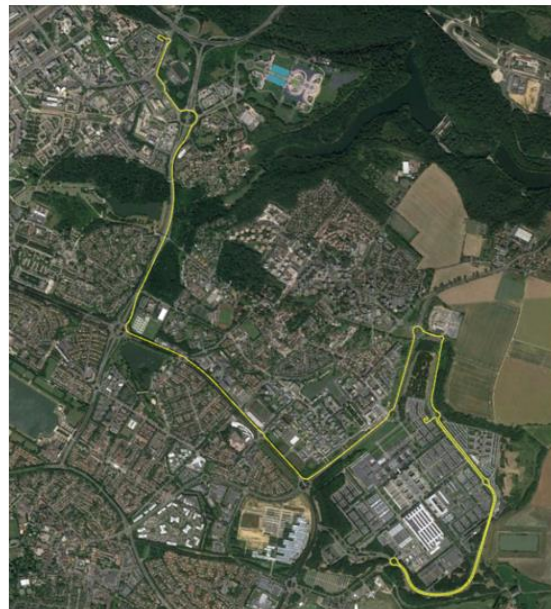
**GROUPE  
RENAULT**



## Pilot with Renault & Sensor fusion

- Drive in dense sub-urban environment with also vegetation
- Sensor fusion using a GNSS receiver Trimble BD940-INS and an antenna Trimble GA830 with the odometer sensors on rear wheels

**Precision achieved : 20 cm cross-track ( $1\sigma$ -68%), 25 cm along-track. The odometer brings continuity of positioning under bridge with same precision level as PPP**



GPS, GLONASS, GALILEO + Odometer

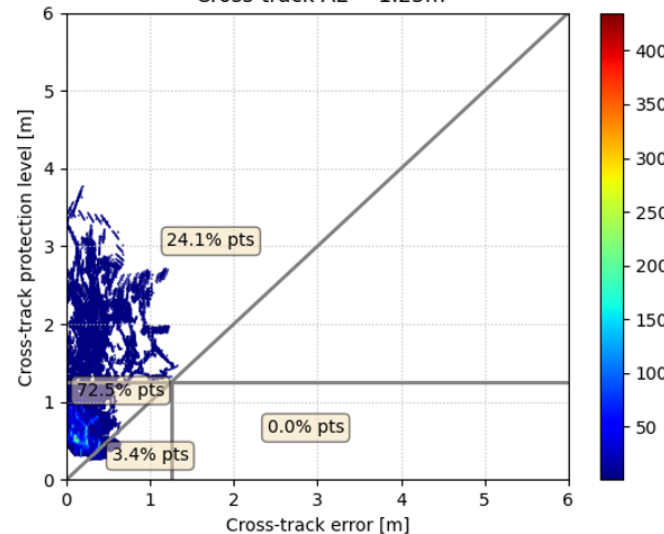


## Pilot with Renault & Sensor fusion

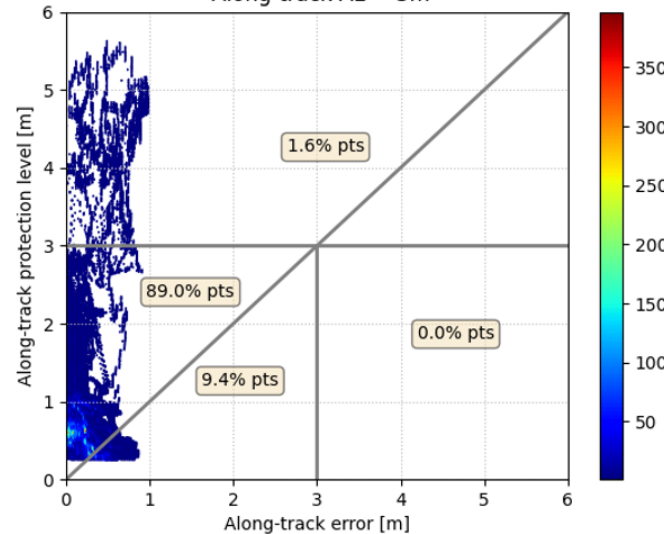
- Drive in dense sub-urban environment with also vegetation (same as before)
- Test of integrity for ISO 26262 with sensor fusion

The availability (nominal operation) of the positioning based on GNSS-PPP+ODO/GYRO for a TIR of  $10^{-7}/h$  is of 72.5% for cross-track and 89% for along-track.

Stanford Diagram on Cross-track (protection level)  
Cross-track AL = 1.25m



Stanford Diagram on Along-track (protection level)  
Along-track AL = 3m



- **Safe operation**
- With better modeling of GNSS ODO/GYRO noises, the Stanford diagram can be improved further for **higher level of availability**