

Integrating NDGPS and SBAS

An Optimal Real-time GPS Mapping Solution

CGSIC Meeting

Presentation 09/20/2010

Portland, OR

Jean-Yves Lauture
Geomatics Product Engineer
Geneq inc.
jlauture@geneq.com

Introduction – Geneq, Inc

- 2003 SXBlue GPS

world's first sub-meter Bluetooth GPS receiver



- 2007 SXBlue II GPS



- 2009 SXBlue II-L GPS



- 2010 SXBlue II-B GPS

world's first integrated SBAS/Beacon,
sub-meter Bluetooth receiver.



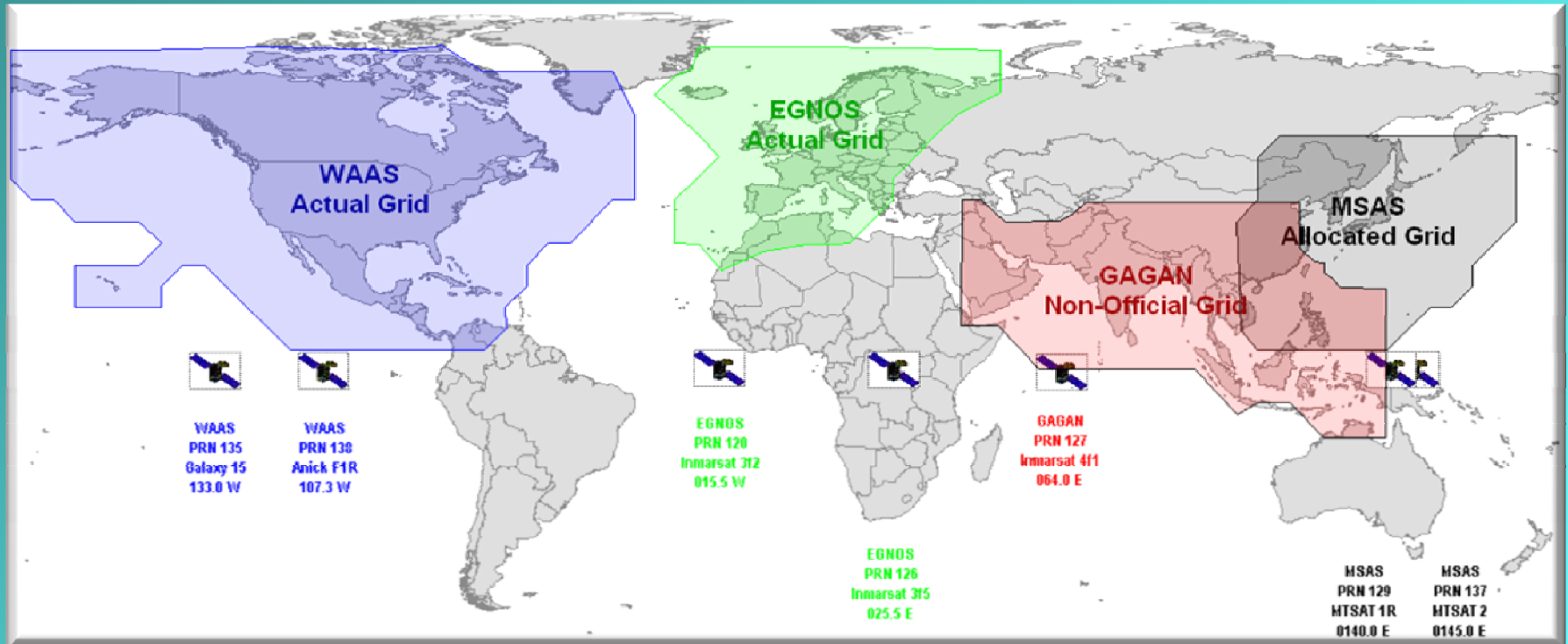
Real-time Sub-meter Mapping

- GIS users prefer sub-meter accuracy
 - Sub-meter accuracy is much less expensive to achieve than a few years ago.
 - Many standards in environmental, transportation, utility, municipalities, etc. specify sub-meter accuracy.
- GIS Users prefer real-time corrections
 - Ability to collect/verify data in the field.
 - Users want to get away from the time and expense of post-processing.
 - Real-time, sub-meter correction signals are free and widely available in most parts of the world.
 - Freedom to use off-the-shelf GPS software

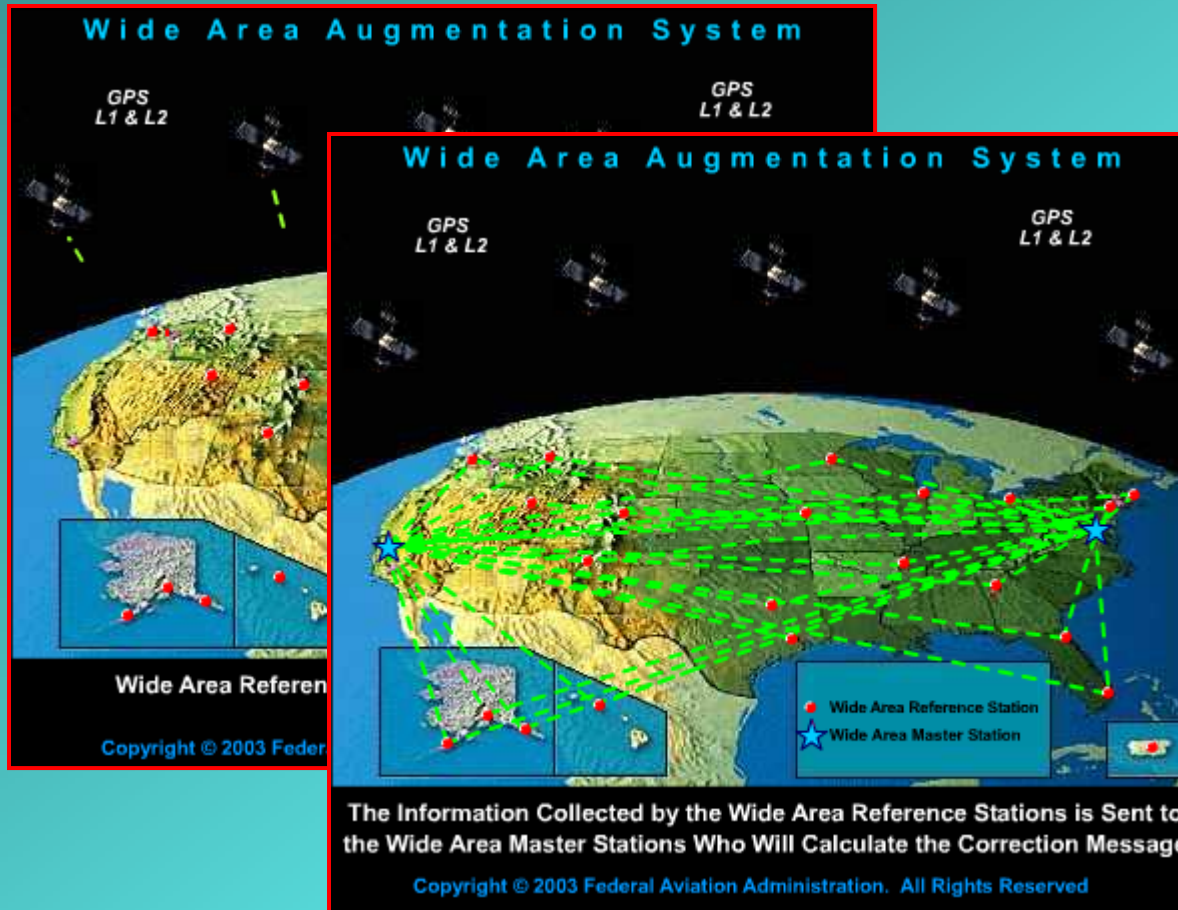
Sources of Sub-meter GPS Corrections

SBAS Brief Overview

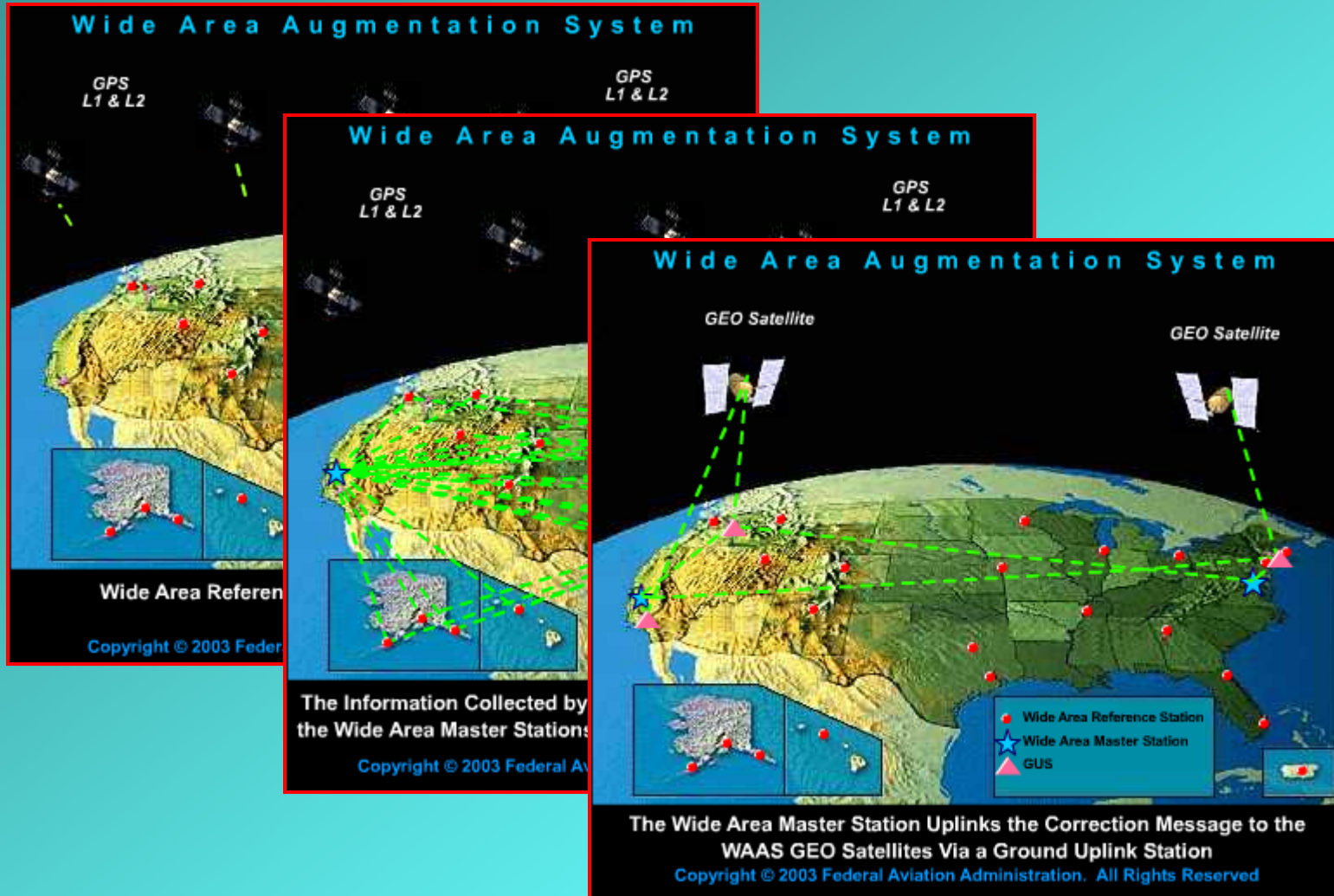
Space Based Augmentation Systems (SBAS)



Space Based Augmentation Systems (SBAS)



Space Based Augmentation Systems (SBAS)



SBAS – Advantages/Disadvantages

- **SBAS Advantages**

- High quality (sub-meter) corrections.
- No cost. Signal is free of charge.
- Coverage in North America (WAAS), Western Europe (EGNOS), Northern Africa (EGNOS), Japan/Korea (MSAS), India (GAGAN under development).
- No extra hardware required. Same frequency as GPS L1.
- Every GPS receiver manufactured today is SBAS-enabled.
- WAAS, EGNOS, MSAS, GAGAN are interoperable.

- **SBAS Disadvantages**

- Signal is same nature as GPS: Line-of-sight and therefore subject to interruption by terrain, buildings or tree canopy.
- Only 1-3 geosynchronous satellites broadcast for each SBAS.

How does the SXBlue Series differ from other SBAS receivers?

- **SBAS was designed for aviation use, but...**
 - The SXBlue Series incorporates unique software that optimizes SBAS for non-aviation users such as GIS, marine, ag, forestry, etc.
 - Will track SBAS satellites where other receivers won't.
- **A Patented Technology: The Coast™**
 - Uses the last received differential correction to maintain sub-meter accuracy for the next 40 minutes.
 - Anticipates how GPS clock and orbital errors will evolve in time and uses received ionospheric map for its predictions.
 - Conventional SBAS receivers with an age limit setup, can only maintain a correction for 3-4 minutes.
 - Results: All-day DGPS (corrected) solution even in forestry applications.

Sources of Sub-meter GPS Corrections

DGPS Beacon Brief Overview

Differential GPS (Beacon) DGPS



Source: www.gnsspro.com

Differential GPS (Beacon) DGPS



DGPS Beacon – Advantages/Disadvantages

- **DGPS Beacon Advantages**

- High quality (sub-meter) corrections.
- No cost. Signal is free of charge.
- Correction signal (283.5-325Khz) doesn't require line-of-sight.
- Coverage in 42 countries, mostly coastal waterways and also inland in the U.S. via the NDGPS program.
- DGPS solution with local correctors less affected by solar activities than SBAS solutions with more global correctors.

- **DGPS Beacon Disadvantages**

- Requires receiver hardware that accepts 283.5-325Khz signal.
- H-field antenna is bulky.
- Cost of additional hardware.
- Limited by transmission range (TX power, other environmental factors)

How does the SXBlue Series differ from other DGPS Beacon receivers?

- **Traditionally, DGPS beacon receivers are separate from GPS receivers, but...**
 - The SXBlue Series incorporates a very small DGPS beacon receiver inside that makes it the smallest DGPS beacon-capable GPS receiver in the world.
 - Geneq developed the world's smallest Micro-B combination GPS/H-field DGPS beacon antenna.
- **A Patented Technology: The Coast™**
 - Uses the last received differential correction to maintain sub-meter accuracy for the next 40 minutes.
 - Anticipates how GPS clock and orbital errors will evolve in time and uses received ionospheric map for its predictions.
 - Conventional DGPS receivers with an age limit setup, can only maintain a correction for 3-4 minutes.
 - Results: All-day DGPS (corrected) solution even in forestry applications.

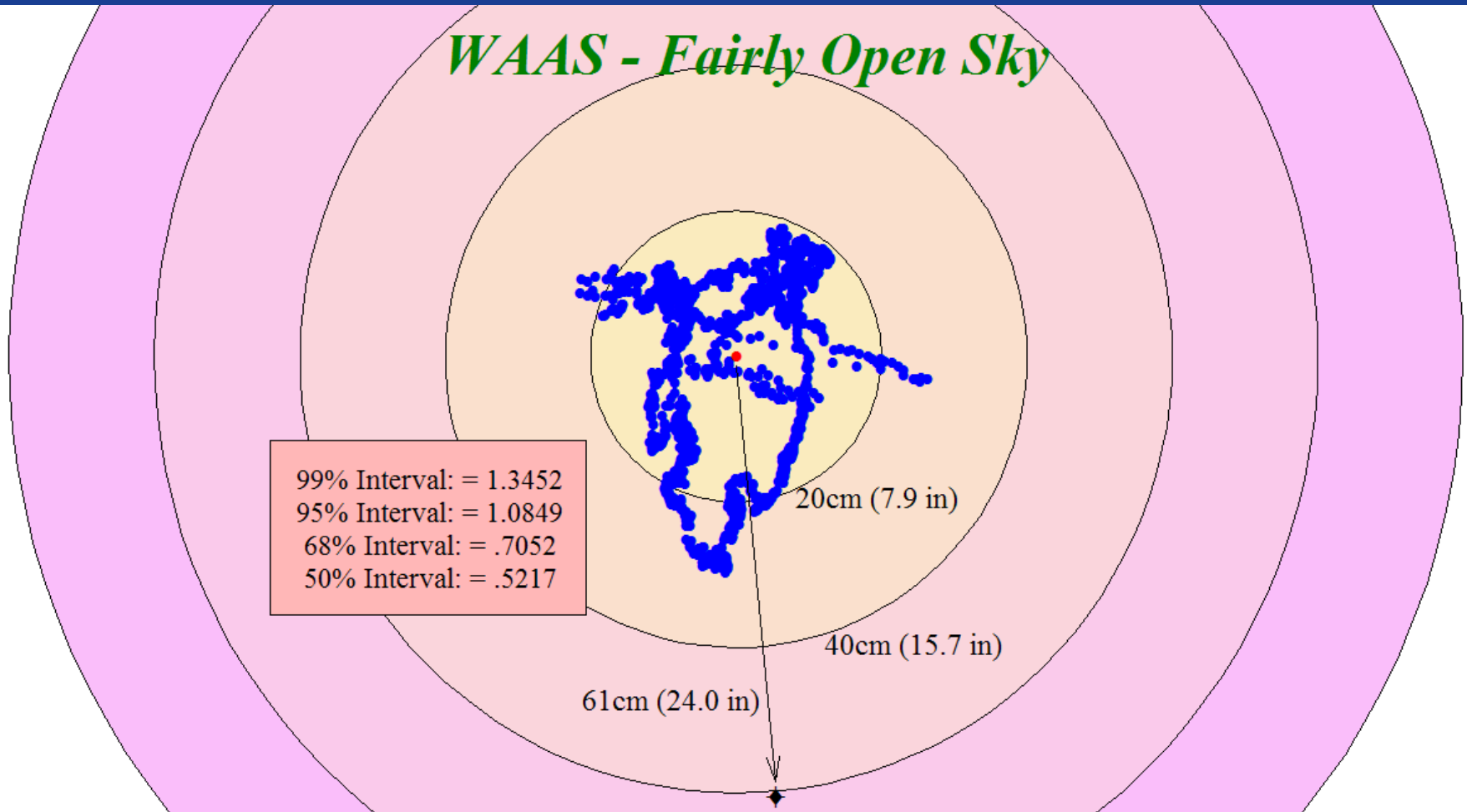
SXBlue II-B GPS

*The world's smallest integrated SBAS/DGPS
Beacon receiver*



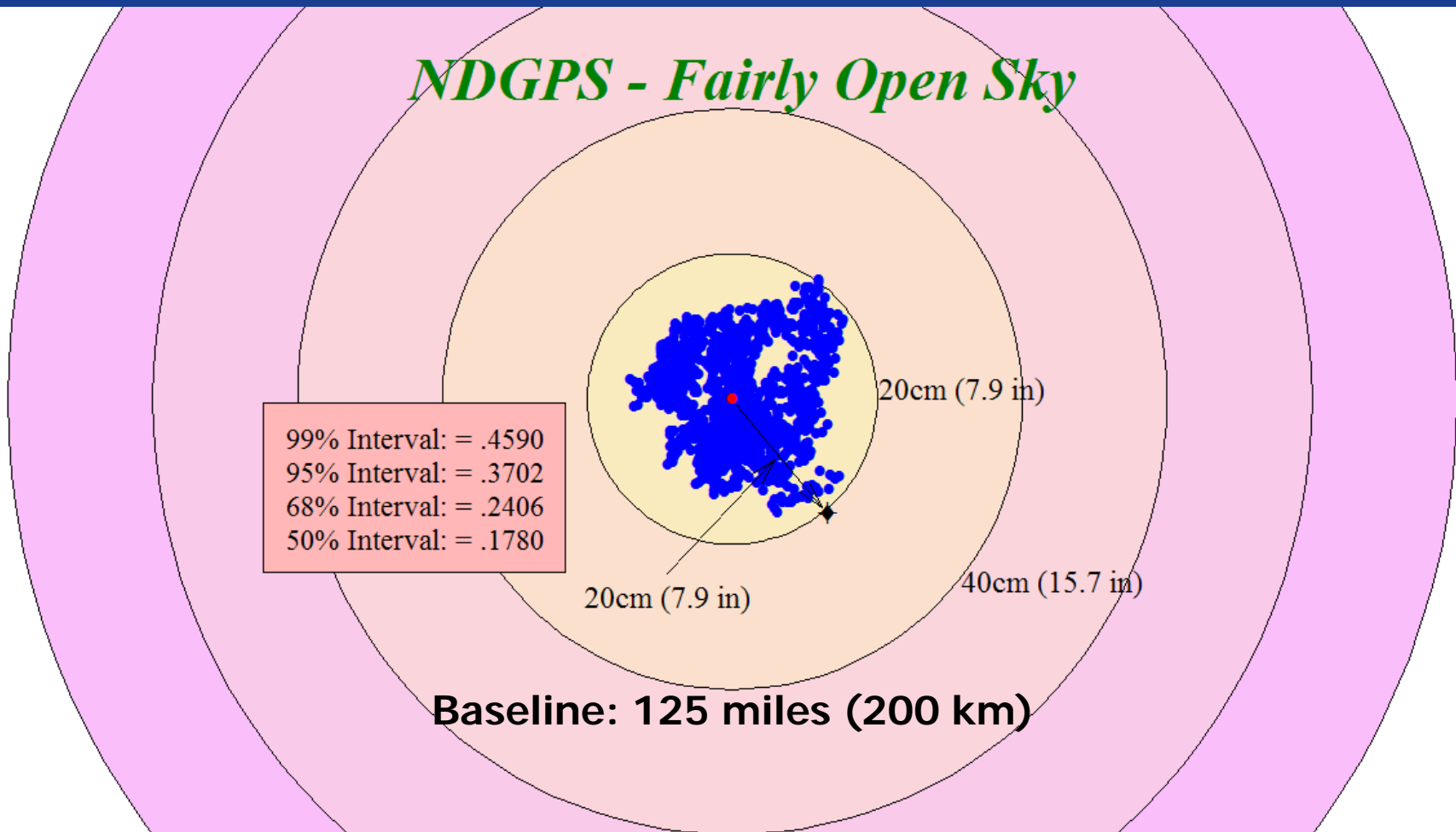
Results

- U.S. National Park Service preliminary test results



Results

- U.S. National Park Service preliminary test results



Considerations & Conclusions

- Both SBAS and DGPS Beacon are accurate sources of sub-meter GPS corrections.
- SBAS and DGPS Beacon have complimentary strengths and complimentary coverage throughout the world.
- The SXBlue II-B GPS was designed to utilize SBAS and DGPS Beacon corrections resulting in free sub-meter corrections in most geographic areas of the world.
- Always know the datum to which the source of differential correction is referenced to:
 - GPS: WGS 84 (G1150) (ITRF 2000, Jan 2002 epoch)
 - SBAS (WAAS, EGNOS, MSAS, GAGAN, etc): ITRF 2000 (current epoch, predicted)
 - NDGPS USA / Canada: NAD 83 (CORS 96, US) / NAD 83 (CSRS 98, Canada)
 - Beacon Worldwide: WGS 84 (version?) or local datum ?
- The future: SBAS (L1/L5), DGPS Beacon (DGNSS Beacon/HA NDGPS?)



Questions?



Jean-Yves Lauture
Geomatics Product Engineer
Geneq inc.
Montreal, Qc, Canada
jlauture@geneq.com
514-354-2511 x211