



SPACE-BASED POSITIONING
NAVIGATION & TIMING
NATIONAL ADVISORY BOARD

**26th Meeting
May 4-5, 2022
Crowne Plaza Annapolis,
Annapolis, MD**

**Positioning environment conditions awareness,
alignement to application needs and requirements,
and interoperability benefit GPS adoption**

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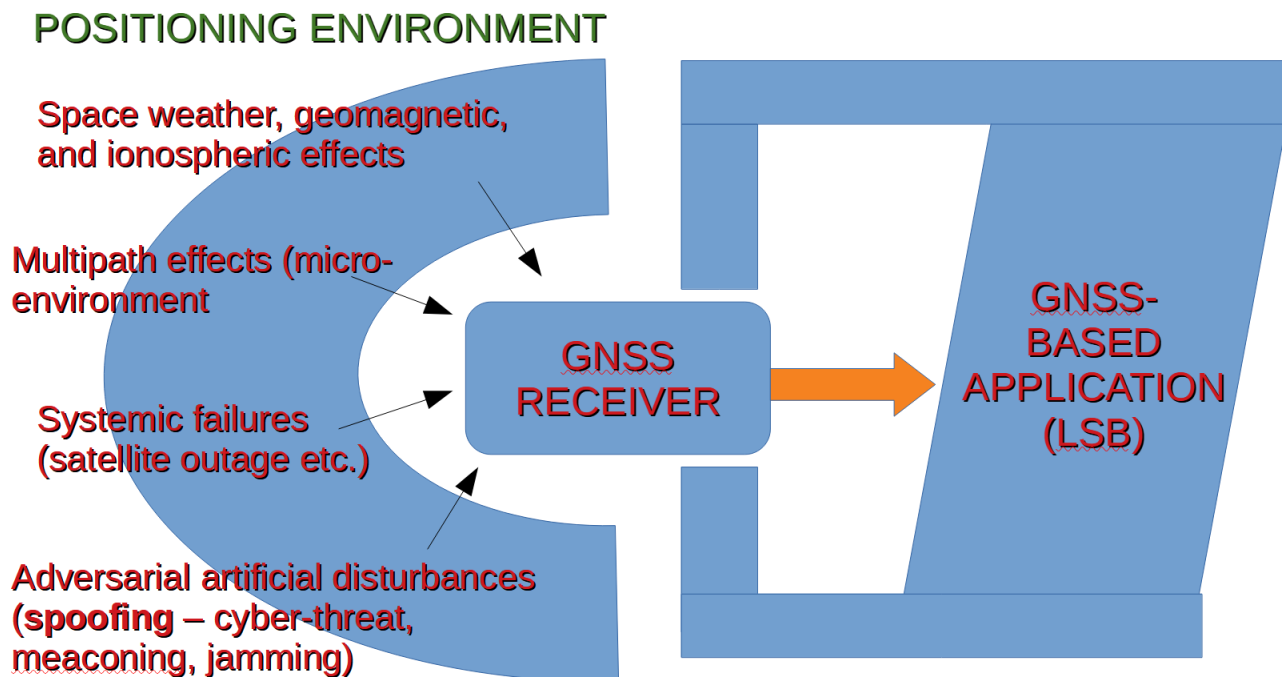
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- **Matured to national infrastructure, GPS needs continued development to answer challenges:**
- **1. Overcoming natural causes of vulnerabilities (space weather/ionospheric conditions and disturbances, multipath etc.)**
- **2. Overcoming growing artificial causes of vulnerabilities (spoofing, jamming, meaconing – cyber attacks on GPS)**
- **3. Alignment with requirements, and facilitation and support of existing and emerging GPS-based applications**
- **4. GNSS interoperability to facilitate the international GPS adoption**

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- Positioning environment play the key role in determination of GPS PNT performance
- GPS operator cannot mitigate the effects outside its control!
- GPS application cannot adapt position estimation process to fit their needs and QoS requirements



Source:
Filjar, R. (2022). An application-centred resilient GNSS position estimation algorithm based on positioning environment conditions awareness. Proc ION ITM 2022, 1123 - 1136. Long Beach, CA. doi: 10.33012/2022.18247

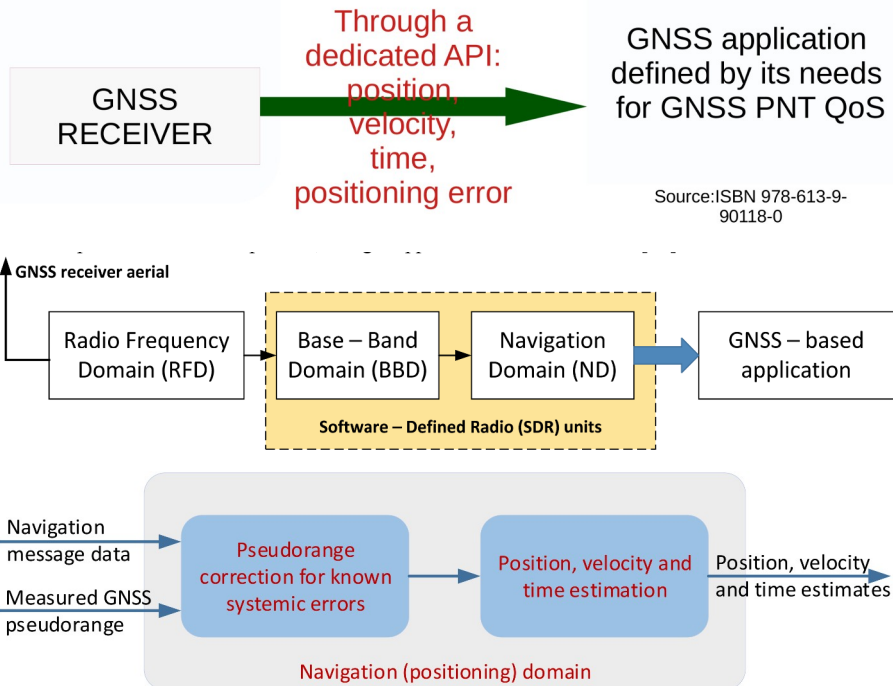
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- Deployment of GPS positioning process evolves due to new technology developments and changing business environment

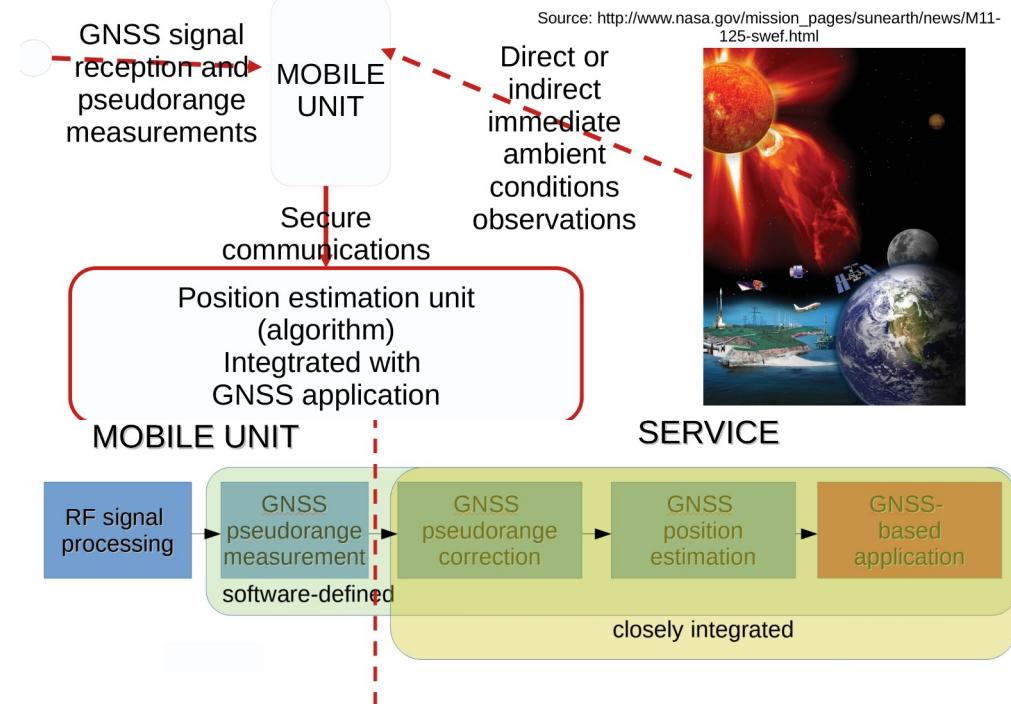
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TRADITIONAL PERSPECTIVE



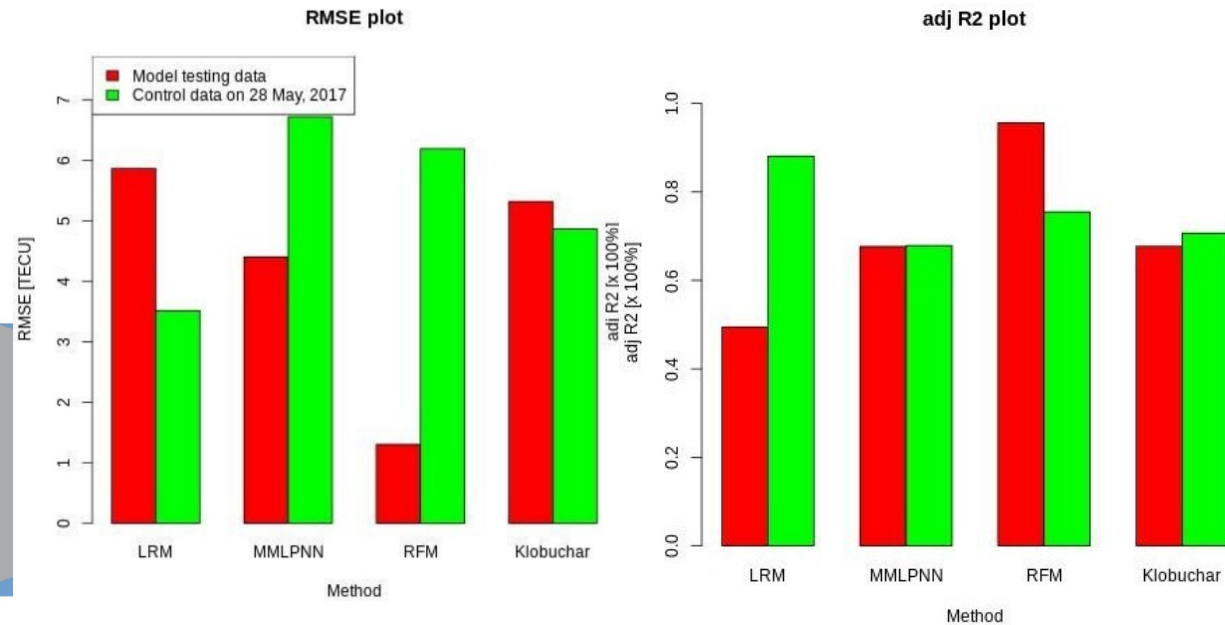
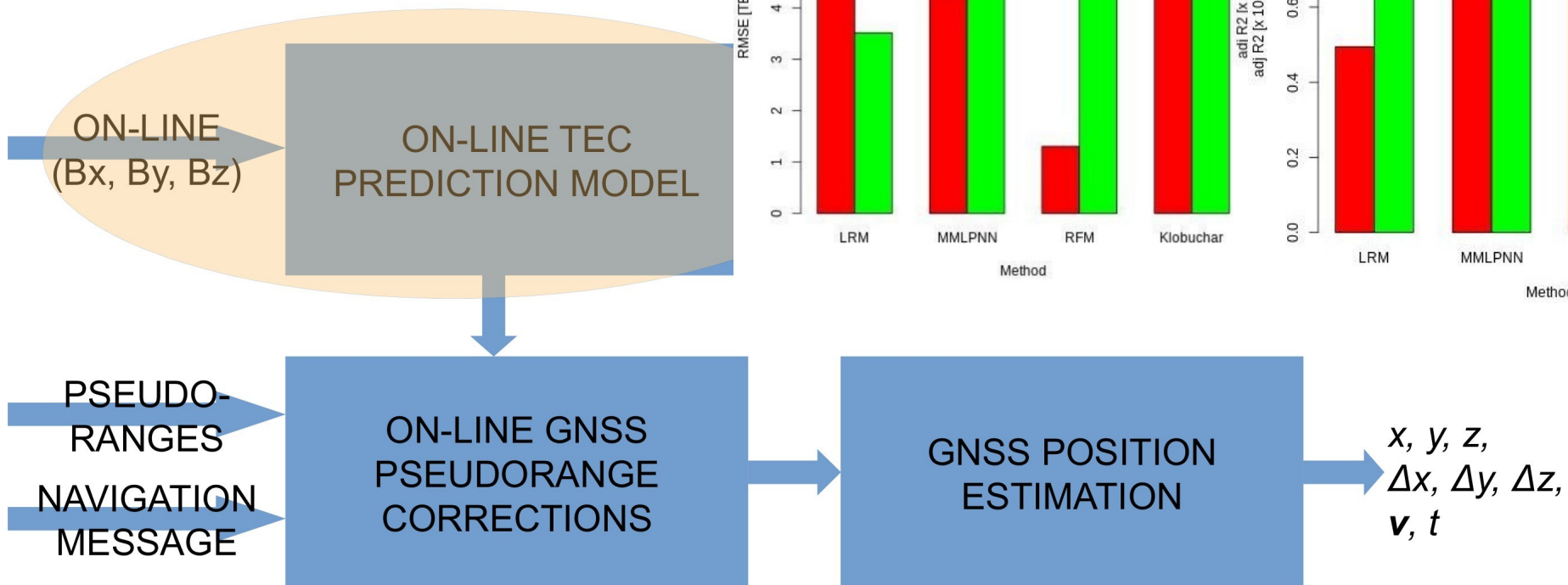
MODERN PERSPECTIVE



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- **Situation awareness of positioning environment conditions may improve significantly the GPS performance**

Sources:doi:
<https://doi.org/10.23919/FUSION45008.2020.9190264>,
[doi: 10.23919/URSIAP-RASC.2019.8738664](https://doi.org/10.23919/URSIAP-RASC.2019.8738664)



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- **Environment-adaptive application-centered GPS positioning process provides:**
- **Alignment with GPS application requirements, as it may adapt the process (select suitable correction models and position estimation method)**
- **Immediate real-time positioning environment conditions awareness combined with statistical/machine learning method may improve positioning performance and resilience against natural and artificial adversarial effects**
- **Enhancement of general adoption of GPS**

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- **Developments needed, involve:**
- **Support and facilitation of GPS application requirements**
- **Information augmentation to positioning environment situation awareness**
- **Statistical/machine learning adoption in position estimation process**
- **Encryption & authentication**
- **Ensuring the GNSS interoperability for international GPS adoption**
- **Legal, regulatory, and standardisation challenges resolved**

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APPRECIATE YOUR ATTENTION!

With invitation to
**BAŠKA SIF (SPATIAL INFORMATION FUSION)
MEETING**
in Baška, Krk Island, Croatia,
in early October 2022

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