Coastal Intelligence for Improving Positioning, Expanding Commerce and Coastal Marine Transportation

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Outline

• Geodetic Review
• Geospatial Infrastructure for Commerce
• Coastal Intelligence
• Marine Transportation
Geodetic Review

Why is geodesy important?

The Earth is an irregular surface and quite difficult to model. Accurate positions and other geospatial data are required for a wide variety of applications.

- Surveying / Engineering
- Positioning / Navigation
- Gravity / Geoid Modeling
- GIS / LIS
- Sea Level Change / Tides / Currents
- Modeling
- Remote Sensing
- Science / Monitoring
Geophysical Changes

Caldera in Utah

Submerged Survey Mark

Dauphin Island Shoreline
Surveying and Engineering

Coordination

Accuracy

Data / Records

Infrastructure

Observations
Positioning and Navigation

Traffic Optimization

Shipping and Commerce

Precision Aviation

Integrating Systems
Sea Level / Tides / Currents

Real Time Systems
- External Components
- Independent Events
- High Speed Execution
- Fast Response
- Low Overhead
- Some Events Related

Local & Offshore Measurements
Geospatial Applications

- Satellite Orbits
- Height Modernization
- Remote Sensing
- Coastal
- Aviation
- VDatum
- CORS
- Coastal Mapping
- Consulting
- Emergency Response
Continuously Operating Reference Stations

CORS enable accurate positioning and provide an interface between land and ocean observing systems:

- Co-located with tide stations, CORS can contribute to local and global sea-level rise calculations by measuring land subsidence relative to water levels.
- CORS data can also be used to monitor and predict the distribution of moisture and electrons in the atmosphere; as well as produce ionospheric models of total electron content (TEC) that impact GNSS-derived positional accuracy.

~ 1900 Stations
NGS delineates the nation’s national shoreline which defines the territorial limits.

- Up-to-date shoreline is an integral component of NOAA’s nautical charts which support a wide range of coastal applications.
- NGS uses multiple remote sensing technologies (digital imagery, lidar, radar, etc.) from various platforms (aircraft, satellites) to survey the shoreline and other areas of interest.
The NGS ECO program is researching how to apply precise positioning models, tools and techniques for marsh restoration to support community resilience in response to climate change.

ECO has also developed guidelines for collecting elevation data and monitoring restoration projects.
To support NOAA's national security and emergency response requirements, NGS collects high resolution, geo-referenced imagery from natural disasters such as hurricanes, tornados and earthquakes.
Geospatial Infrastructure for Economic Growth
Coastal Intelligence
Coasts and Coastal Communities

Environmental Impacts and Challenges

- Climate change
- Sea level rise / flooding
- Catastrophic events (hurricanes / typhoons)
- Financial loss
- Economic and physical impacts
- Resources
- Population growth
- Development
- Marine transportation
Coastal Intelligence - Benefits

- Foster healthy and sustainable coastal and marine resources, habitats and ecosystems
- Strengthen the resilience of communities and regions
- Scientific data for decision making, products and services as well as actionable information
- Provides insight on present and future conditions of the coastal zone
- Enhancing economies
- Managing resources
Coastal Intelligence - Integration

• Integrated support tools for port communities
  – Real time systems and access
  – Web-based, smart systems (iphone, tablets etc.)

• Regional data and predictions of physical systems
  – Tides, currents and waves
  – Salinity, water temperature and visibility
  – Wind speed and direction

• Early warning systems
  – Ecological hazards
  – Inundation / flooding
Marine Transportation
Marine Transportation - Commerce

- Society depends on maritime commerce
- ~75% of trade involves marine transportation
- Gross Domestic Product (GDP) and coastal infrastructure
- Contributes to the global economy
- Impacts to goods, services and people
- Cost effective
- Competition
Marine Transportation – Coastal Infrastructure

Decisions based on...

Aids to navigation
- Electronic nautical charts (ENC), radar, depth sounder
- Positioning – GPS, DGPS, Loran, EGNOS

Local knowledge and information
- Winds, visibility and sea conditions
- Currents, tides and depths
- Pilots

Ship characteristics
- Draft
- Manifest
- Size
Marine Transportation – NOAA PORTS®

Real-time observations to improve safety and economic efficiency of maritime commerce

• Reliable, cost-effective information on the environmental state
• Integration of oceanographic and meteorological sensors
• Designed to meet coastal community needs
  • Water sensors, currents, waves, salinity, temperature
  • Ship bridge height, winds, visibility
  • Designed for 24 hours a day, every day of the year operation
  • Simple (1 – 2 sensors) to complex (100+ sensors)
Marine Transportation – NOAA PORTS®

Benefits

- Improved safety
  - Reduce commercial marine transportation accidents
  - Reduce recreational boating accidents
  - Fewer groundings and collisions
  - Fewer weather-related incidents
- Increased efficiency
  - More efficient commercial marine transportation
  - Enhanced fishing productivity
- Improved storm surge forecasts
- Improved public services
PORTS® currently serves about one-third of the 175 major seaports in the U.S.

Percent of 175 major seaports currently served by PORTS®: 34%

Percent of depth constrained total tonnage that passes through seaports currently served by PORTS®: 75%

- Major U.S. Seaport
- Major U.S. Seaport Served by PORTS®
Gracias