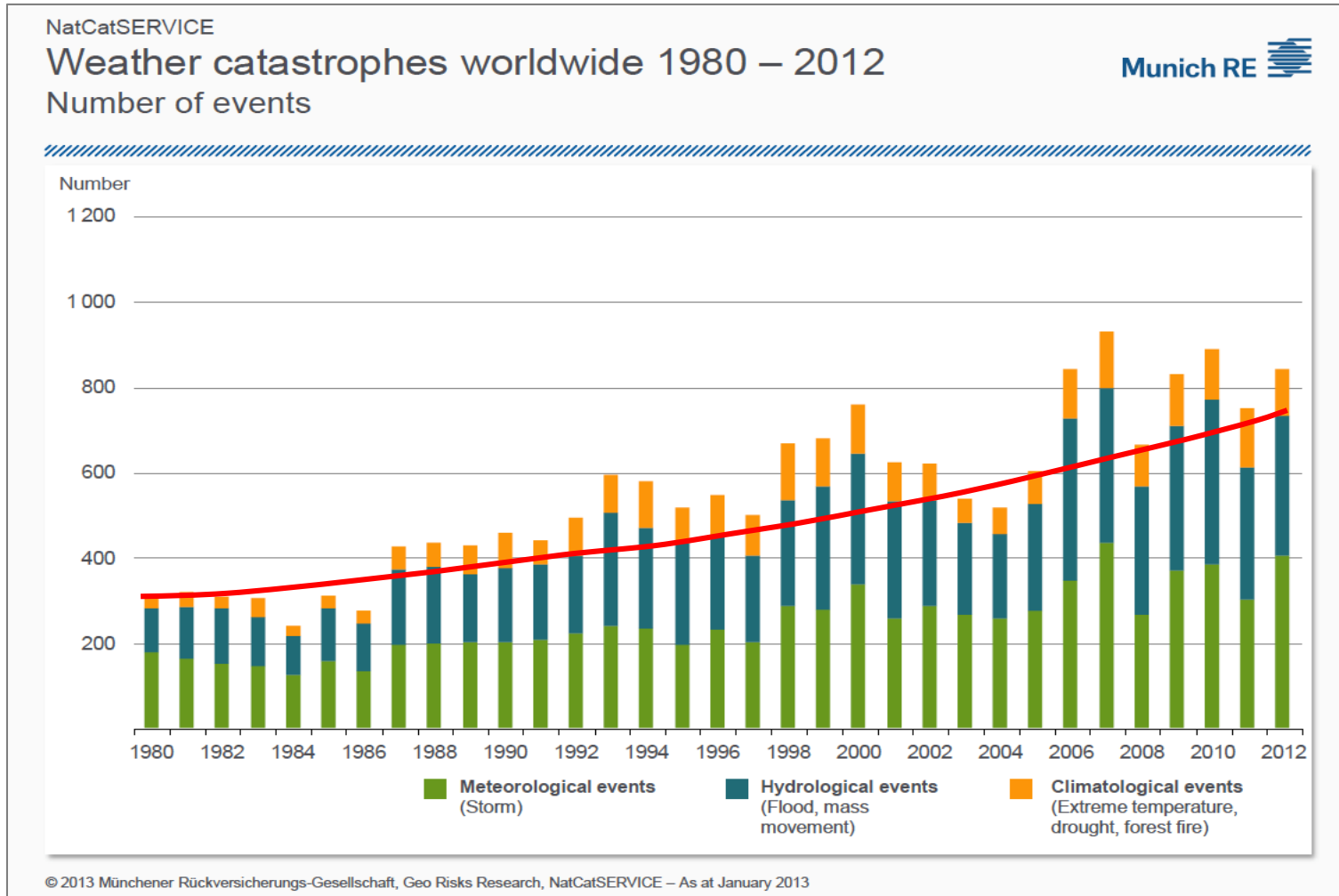




CRITICAL DATA FOR A SMARTER PLANET

How Commercial Satellite Data Can Coexist With Data Sharing Policies and Principles

Weather-Related Disasters Becoming More Frequent Worldwide



One of the main U.S. weather satellites fails



THE WALL STREET JOURNAL

For Weather Satellites, Forecast Is Cloudy

Failures of Aging Devices Threaten to Leave Gap in Key Data

The New York Times on NBC

Aging weather satellites get noticed with threats like Sandy



Going Blind: The Coming Satellite Crisis

Satellite Data Gap Could Have “Catastrophic National Consequences”

-NOAA Independent Review Team

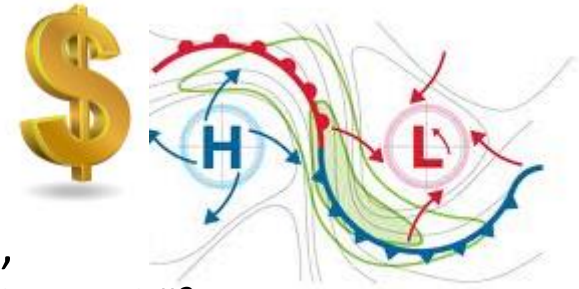


Background chart from Science News

“Potential gaps in environmental satellite data beginning as early as 2014 and lasting as long as 53 months”

-Government Accountability Office

Total global weather sensitivity (absolute dollar amount at risk due to weather) is \$9.74 Trillion/yr¹



- Insurance payouts due to weather-related catastrophes now total **\$70 Billion/yr** worldwide, with 70% of companies exposed to “severe weather risk”²
- 3.4% of U.S. GDP—**over \$500 Billion**—is affected by weather³
- Monsanto buys Climate Corp for **\$930 Million**⁴; General Atlantic buys MeteoGroup for **\$260 Million**⁵
- U.S. commercial weather & climate industry valued at **\$6 Billion/yr**⁶
- Japan’s Weathernews becomes 1st weather company to launch satellite
- Severe solar storm could cost U.S. as much as **\$2.6 Trillion**⁷

“The driver of the business is people understand you can’t manage the weather, but you can manage the financial implications of the weather.”⁶

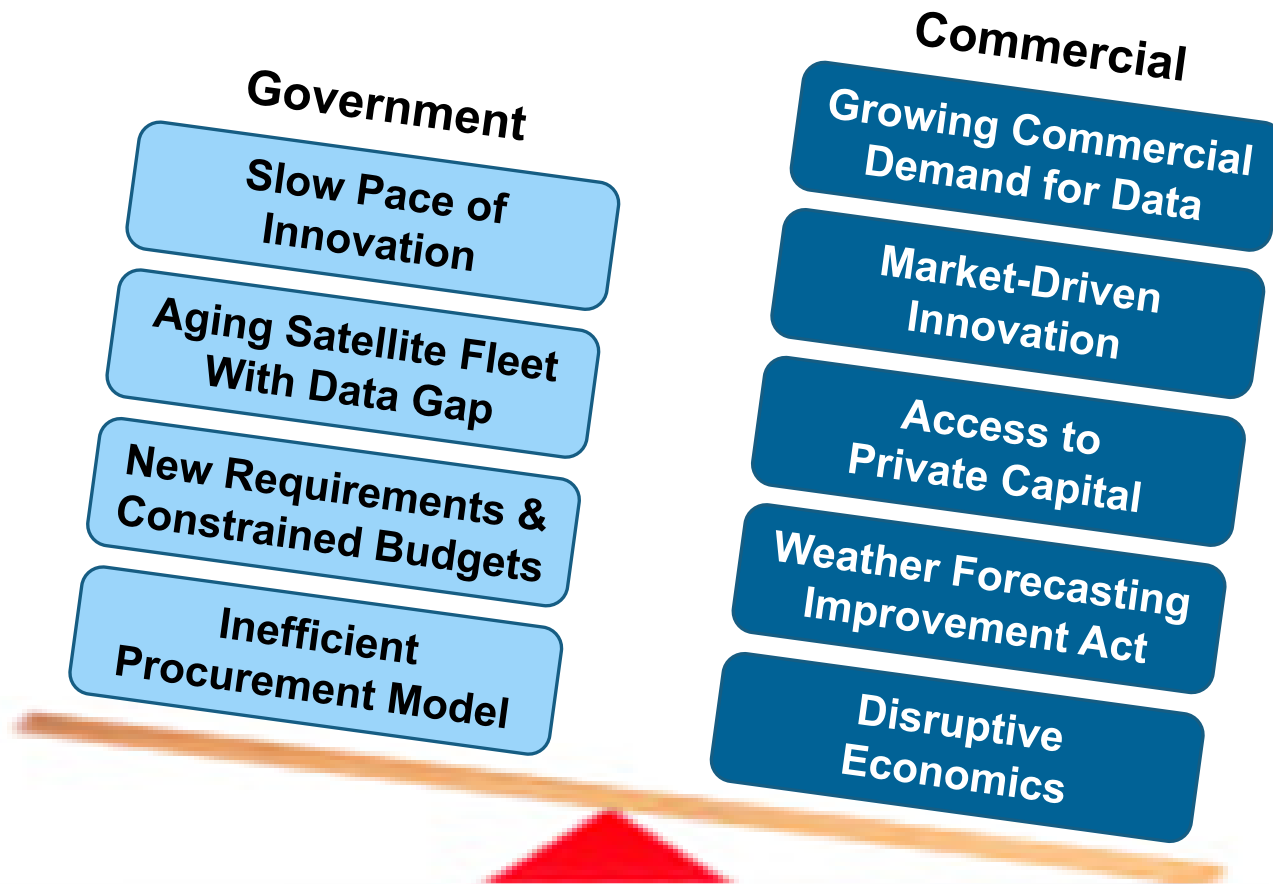
1 WeatherBill/Climate Corp
2 Allianz

3 Near Earth LLC
4 Forbes

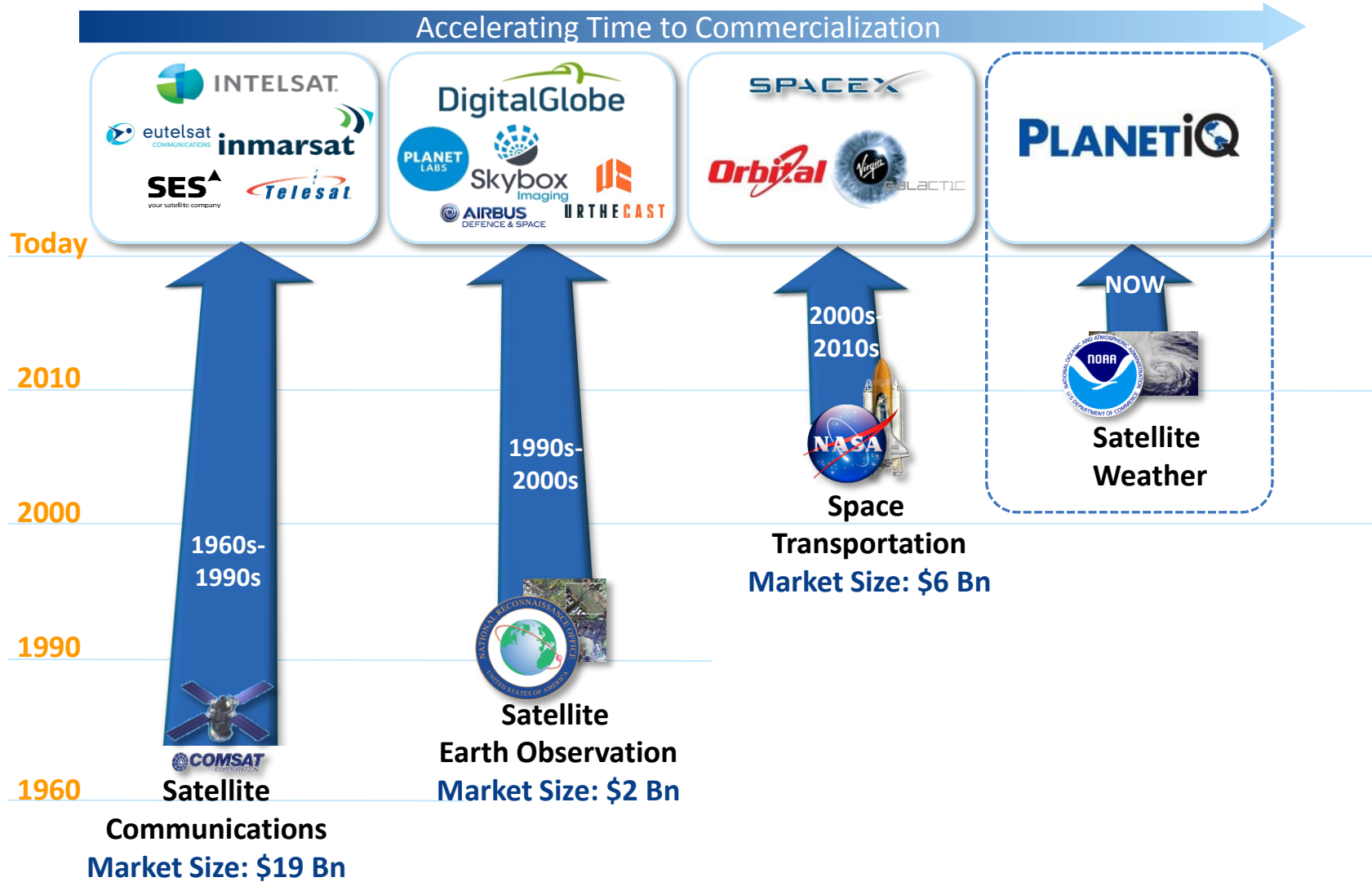
5 Financial Times
6 Wharton

7 Lloyd’s

Commercial Demand, Data Gaps and Strained Government Procurement Model Are Driving Commercialization of Weather Satellite Industry



Following Well-Paved Commercialization Path



Note: Arrow heights illustrate accelerating time to each successive market's commercialization

Augmenting Government Systems With Commercial Data Lowers Costs and Increases Innovation for Weather Forecasting and Climate Research

- Leverages private funds to field new observing systems quickly and at lower cost
- No up-front costs or deployment risk for government or private customers
- Spreads costs among customers worldwide, resulting in substantially lower long-term costs for everyone
- Science and technology innovations transferred more quickly into operational spacecraft and sensors
- Allows governments to devote more resources to scientific research and improved weather forecasting and climate modeling



Commercial Data: Different Means to a Better End



GOVERNMENT (ex: Joint Polar System)

Governments Fund the Build, Launch & Operation of a Global Constellation

Costs are spread among contributing nations...



NOAA Flies Afternoon Orbit

US DoD Flies Morning Orbit

EUMETSAT Flies Mid-Morning Orbit



- 👍 Enables Global Data Provision
- 👎 Delays & data gaps due to budget shortfalls
- 👎 Higher costs, slower innovation
- 👎 Drains funding from other activities
- 👎 **Governments/taxpayers assume ALL technical and financial risk**

COMMERCIAL AUGMENTATION

Private Sector Provides Up-Front Funding for Build & Launch of a Global Constellation

Costs are spread (via data buys) among government & commercial customers...



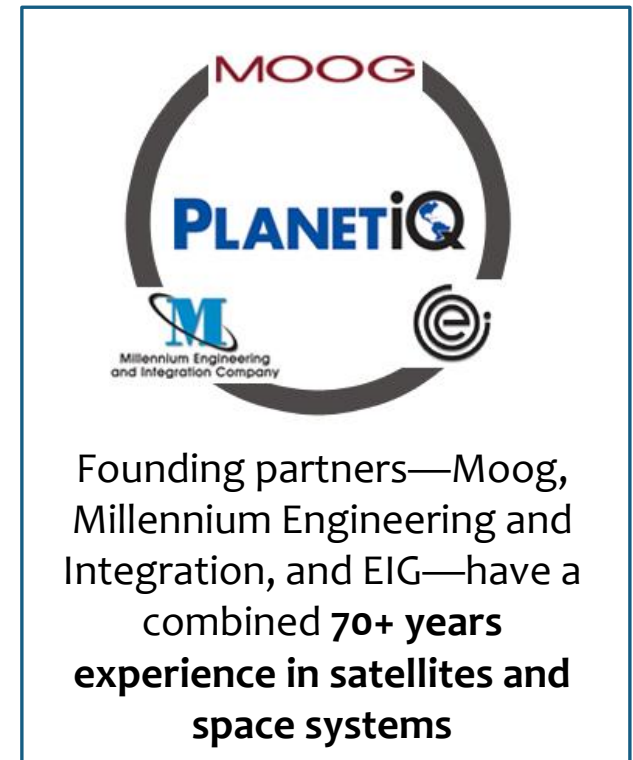
- 👍 Enables Global Data Provision
- 👍 Increases resiliency of global observing system
- 👍 Lower costs, faster innovation
- 👍 Allows more funding for other activities
- 👍 **Private sector assumes ALL technical and financial risk**



GOVERNMENT + COMMERCIAL DATA DRIVES MAXIMUM IMPACT & EFFICIENCY

Earth observation data provider focused on delivering critical data to customers worldwide in real-time for weather forecasting, climate monitoring & space weather prediction

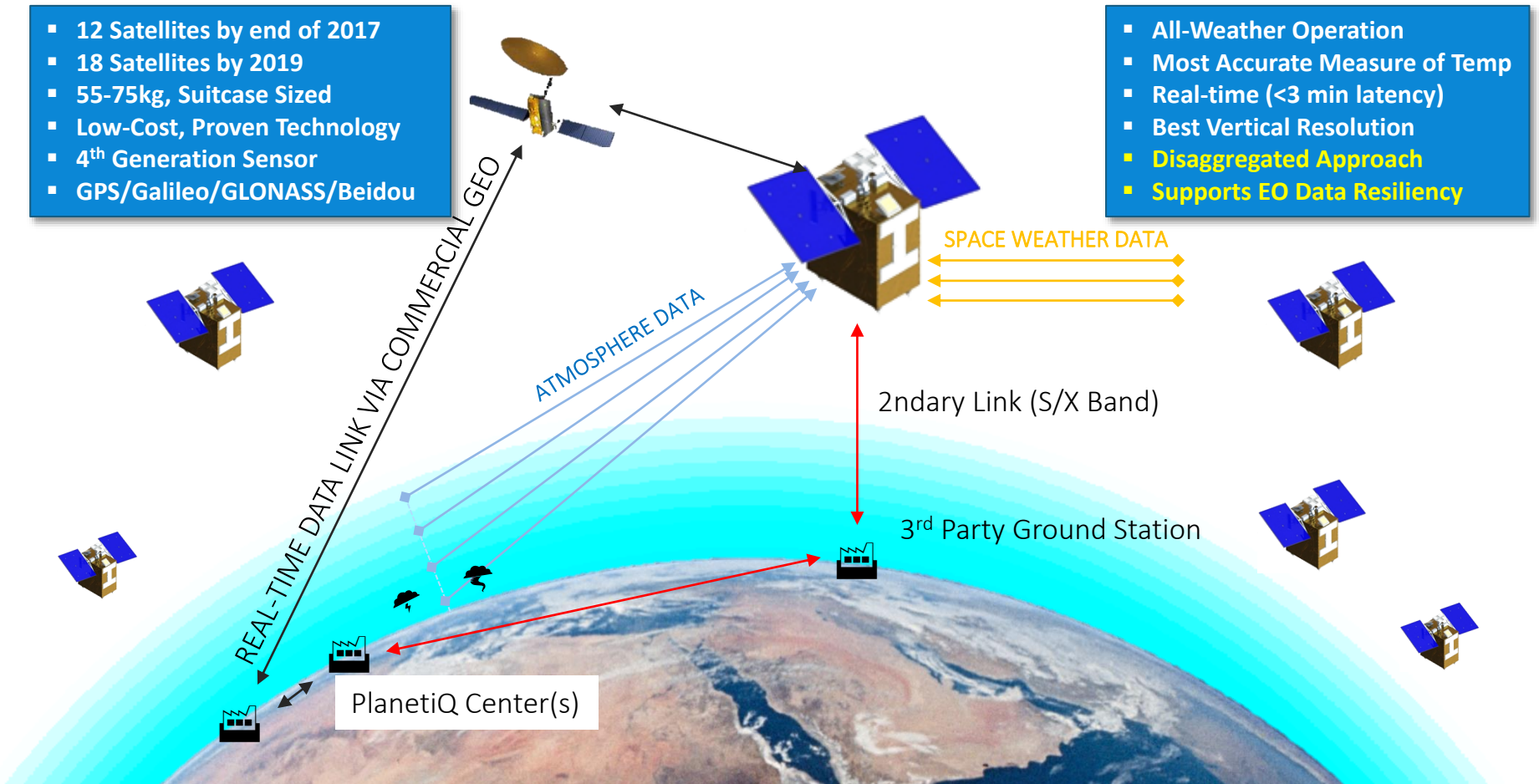
- Will launch privately funded constellation of 18 small satellites carrying gold standard for GPS Radio Occultation sensor
- Global distribution of over 8 million observations per day of temperature, pressure, water vapor & electron density
- Reliable, long-term supply of critical data with no up-front cost or deployment risk for customer and lower long-term costs



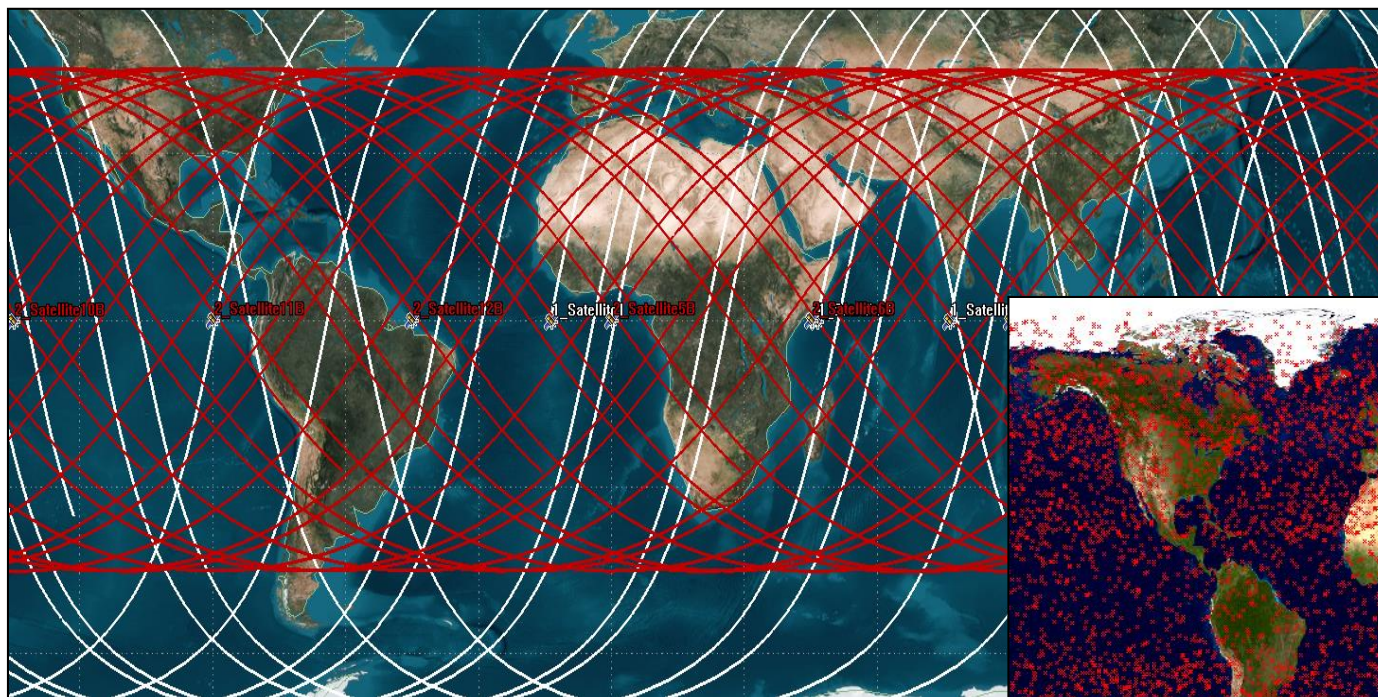
Constellation of 18 GPS Radio Occultation Satellites Will Collect Over 30,000 Occultations/Day for Weather, Climate & Space Weather

- 12 Satellites by end of 2017
- 18 Satellites by 2019
- 55-75kg, Suitcase Sized
- Low-Cost, Proven Technology
- 4th Generation Sensor
- GPS/Galileo/GLONASS/Beidou

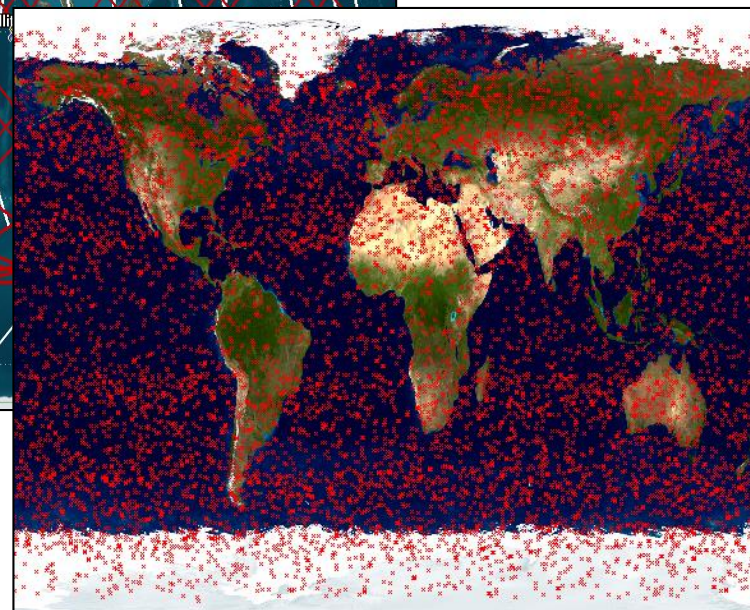
- All-Weather Operation
- Most Accurate Measure of Temp
- Real-time (<3 min latency)
- Best Vertical Resolution
- **Disaggregated Approach**
- **Supports EO Data Resiliency**



PlanetiQ's Constellation of 18 Satellites Will Provide Over 8 Million Observations Per Day for Weather, Climate and Space Weather

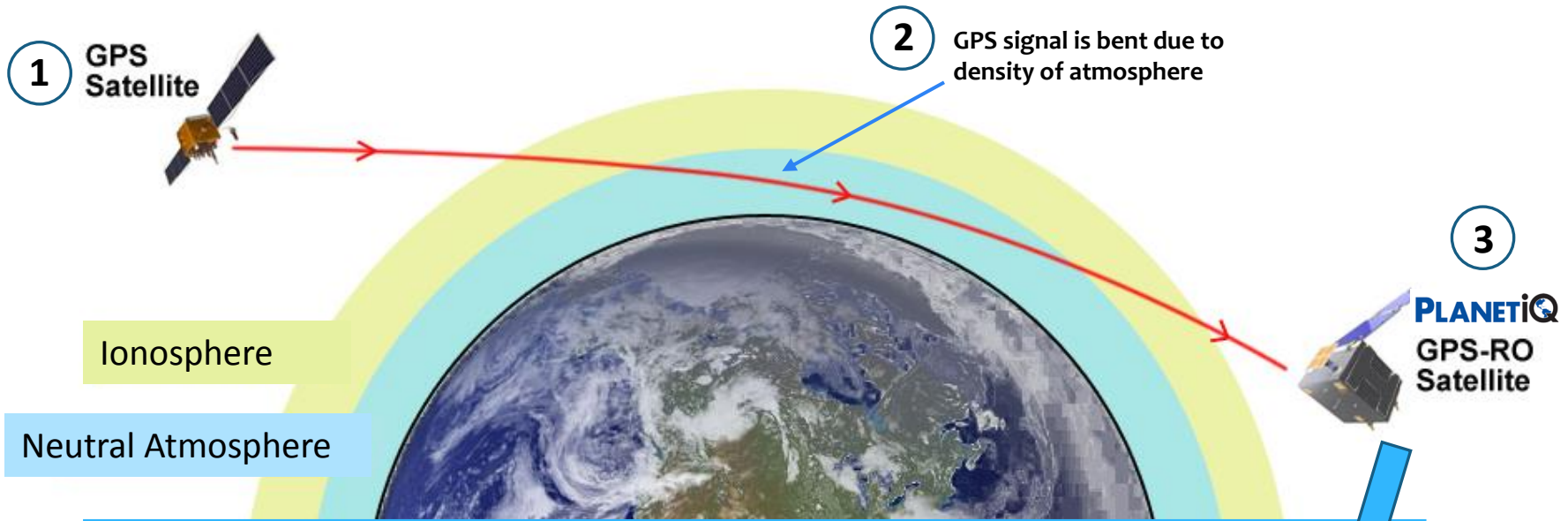


PlanetiQ satellite constellation ground tracks

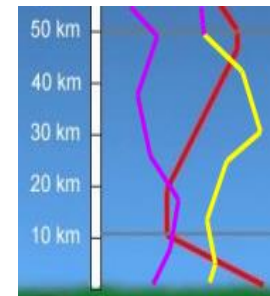


Complete global data coverage

GPS Radio Occultation: How It Works



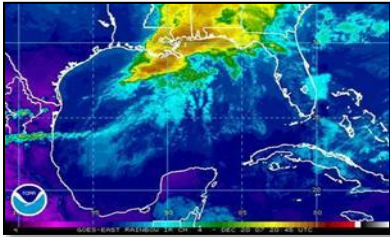
1. Radio signal is transmitted by an existing GPS satellite.
2. The signal is bent as it passes through (is occulted by) Earth's atmosphere due to the density of the atmosphere. The bending causes the signal to travel a longer path through the atmosphere.
3. The signal is received by a GPS-RO satellite (carrying a GPS receiver) that uses the time delay in the signal's arrival to calculate the bending angle.
4. The bending angle is used to calculate temperature, pressure, water vapor and electron density in the atmosphere, all of which are a function of atmospheric density.



4

Output: Temperature, pressure, water vapor & electron density by altitude; like a weather balloon but much better

Weather



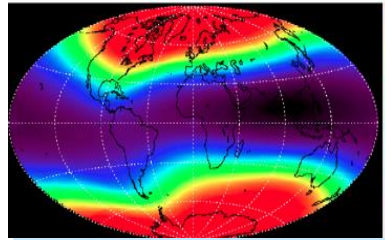
Global Atmospheric Profiles of:

- Refractivity
- Temperature
- Pressure
- Water Vapor

Greatly Improves Accuracy of Weather Models

Data Calibrates Other Atmospheric Sensors

Space Weather



Ionosphere

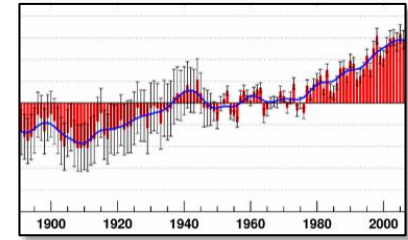
Measurements of:

- Total Electron Content
- Scintillations
- Local Energetic Particles
- F-Region

Real-Time Delivery for Nowcasting & Warnings

Vital to Protecting Power Grid & Communication Systems

Climate



Global Atmospheric Profiles of:

- Refractivity
- Temperature
- Pressure
- Density

Most Accurate Measure of Temperature

Detect Climate Change and Improve Climate Models

GPS-RO: Biggest Bang for the Buck

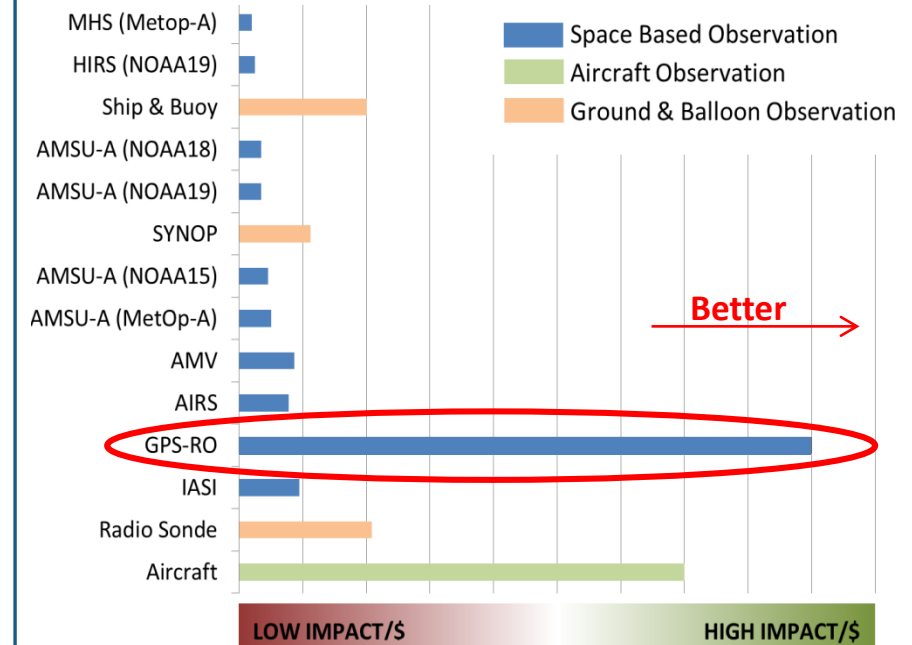
Key Advantages of GPS-RO

- All-Weather Operation
- Best Vertical Resolution
- Global Coverage, Real-Time
- Most Accurate Measure of Temp
- Demonstrated Science Value
- Low Cost, Proven Technology

“ No other observing system provides such high-quality, global observations. ”

-Anthes, 2011

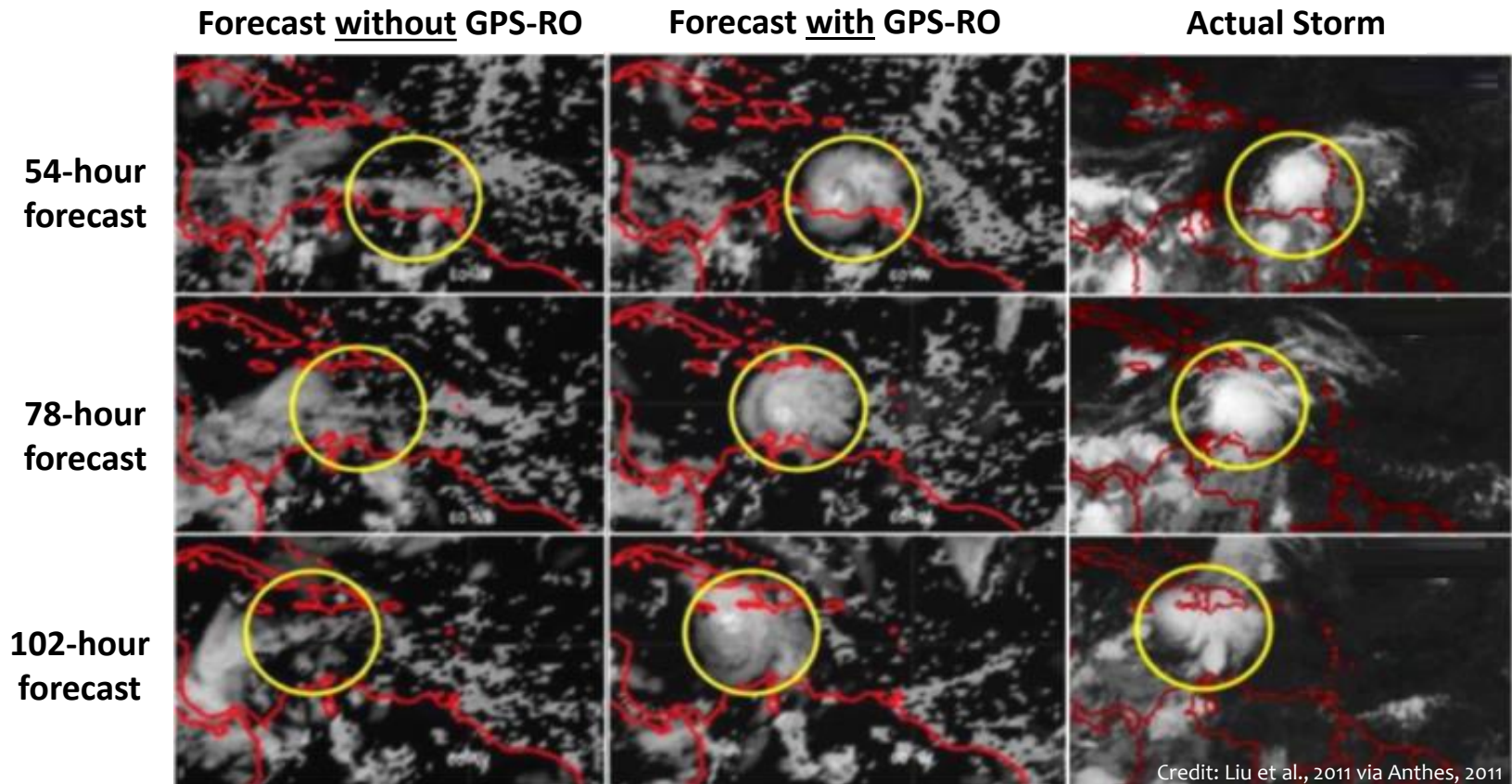
Impact on Forecast Accuracy Per Dollar Spent



GPS-RO data is one of the top contributors to forecast accuracy¹ and the most cost-effective

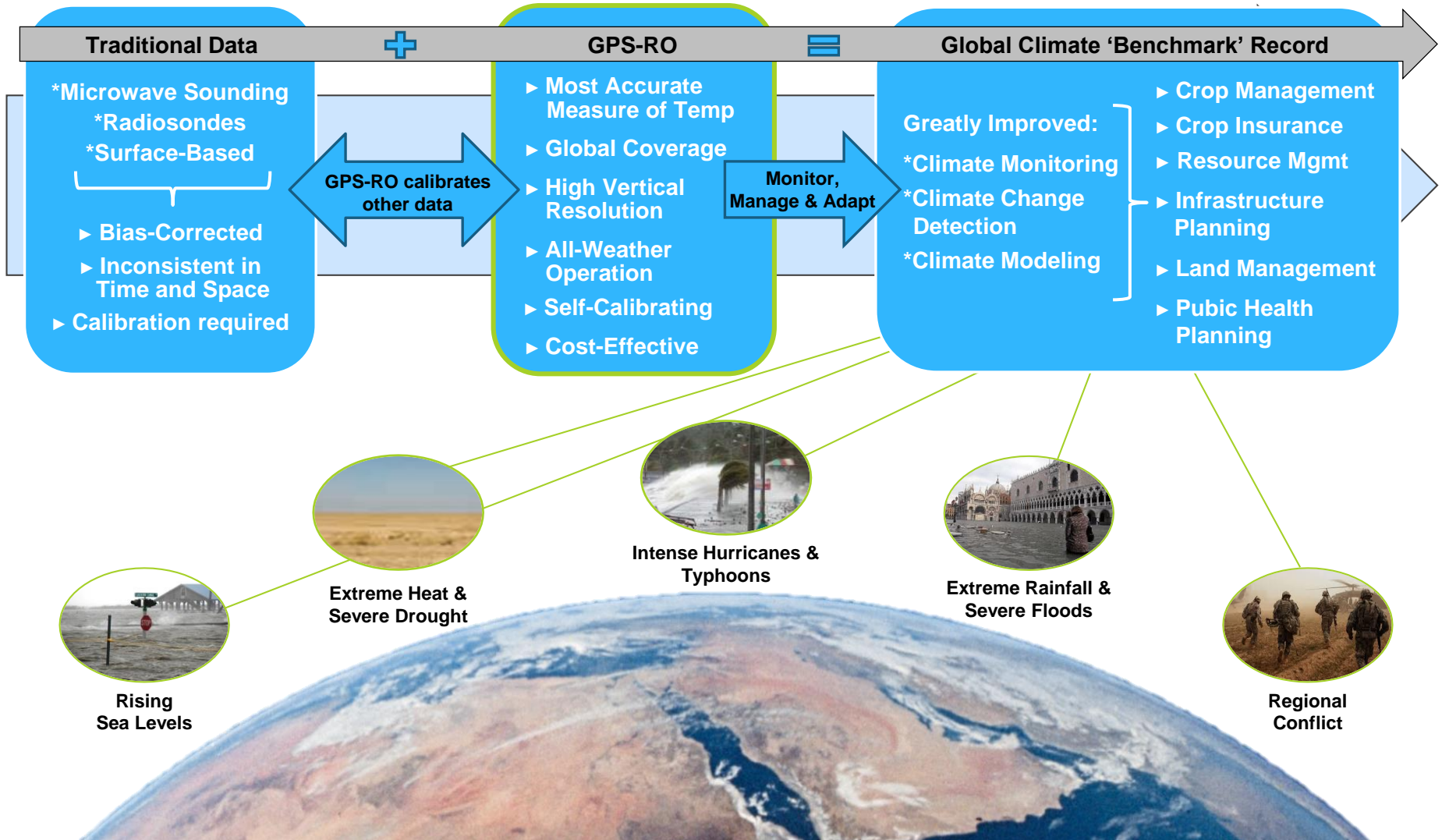
¹ Shown by multiple analyses including ECMWF, Cucurull, Ota

GPS Radio Occultation Data Yields Dramatically Improved Forecast of Hurricane Ernesto (2006)



Explainer: Model forecasts made with GPS-RO data (middle column) show a strong and well-defined storm similar to the actual satellite image of the storm (right column) at 54 hours (top row), 78 hours (middle row) and 102 hours (bottom row) lead time. Model forecasts made without GPS-RO data (left column) show no organized storm at all.

GPS-RO: A Benchmark Measure for Climate Change



Archived Data Available at No Cost to Research & Education Users

Over 8 million daily observations around the world will:

- Establish long-term climate record based on most accurate measure of temperature
- Greatly enhance climate monitoring, climate change detection, and testing of climate models
- Encourage research to improve the impact of GPS-RO data on weather forecasting and space weather prediction
- Empower faculty and students with high-quality data and support research on additional uses for the data



Benefits to PlanetiQ LLC include:

- Goodwill in the science and research community
- Drive demand and increase user acquaintance with GPS-RO data
- Avoid negative licensing conversation based upon “use case” licensing

- Commercialization of satellite imagery sets precedent for satellite weather data
- Governments around the world already purchase ground-based weather data and restrict use in a manner that enables commercial business models
- Primary value of GPS-RO data results from ingest into global weather models, the output of which is not restricted under subscription license
- Data to be distributed free of charge for research use
- With an open mind, open dialogue and a spirit of cooperation, the public and private sectors can work together to reconcile commercial business models with data policies in a way that:
 - **Increases the resiliency** of the global observing system
 - **Drives innovation, lowers costs, and...**
 - **Significantly improves the weather forecast** for users worldwide

