

# An Emerging New Direction in Remote Sensing for Earth Science: The Technology of GPS Occultations

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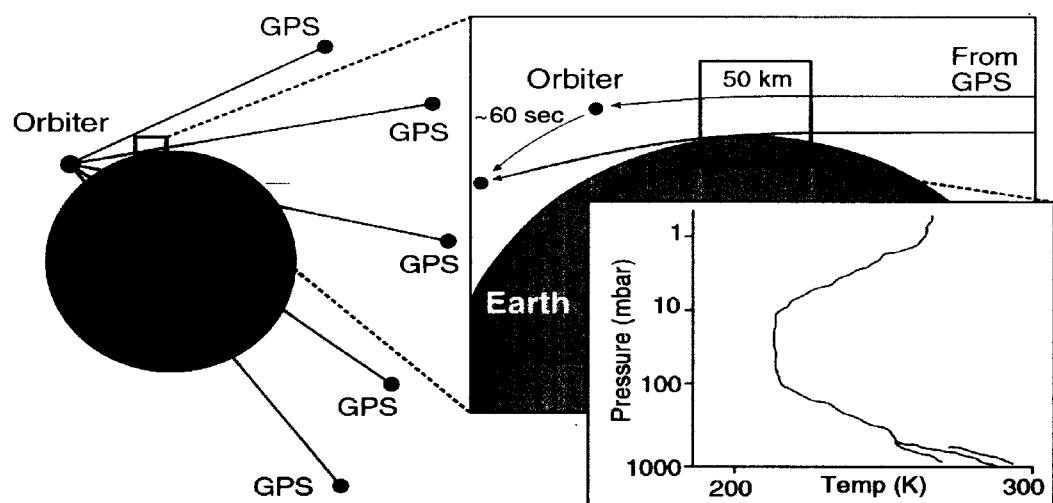
4800 Oak Grove Drive

Pasadena, CA 91105

<http://genesis.jpl.nasa.gov>

## Flight Test Results: new flight receiver algorithms and new science data

### GPS Occultation Concept

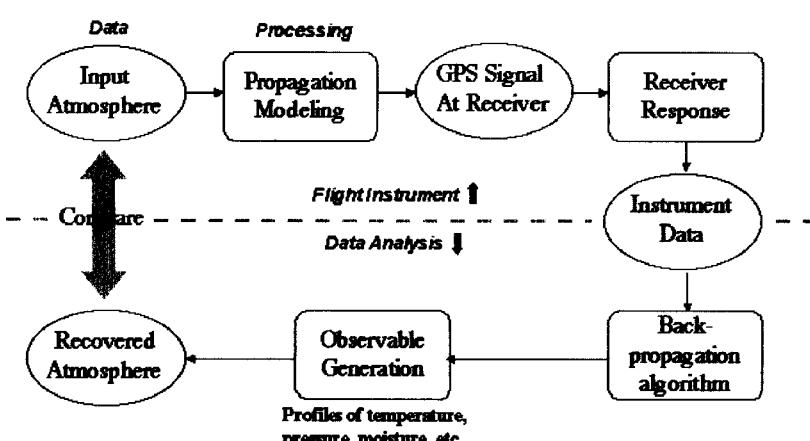


- How well can long-term climate change be assessed or predicted?
- How are global precipitation, evaporation, and the cycling of water changing?
- How well can transient climate variations be understood and predicted?

### Remote Sensing Characteristics

- **Sampling:** Simultaneous coverage of multiple local times
- **Information Content:** Temperature and pressure vertical profiles @ 1km; H<sub>2</sub>O content in last few km; Ultra-high sensitivity to vertical layers
  - ✓ 25 km altitude to surface
- **Sensitivity:** Stable temperature reference over decades; about 1 K accuracy

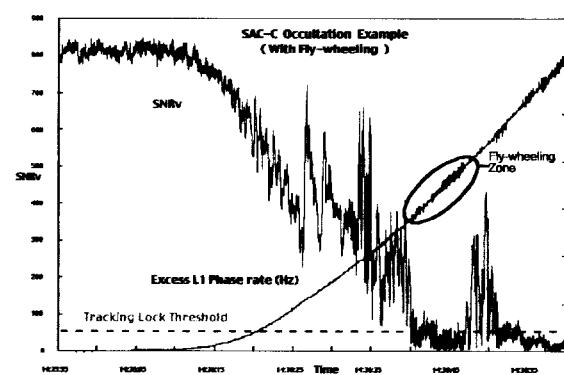
### First End-to-End GPS Occultation Simulator



### Current and Planned Missions

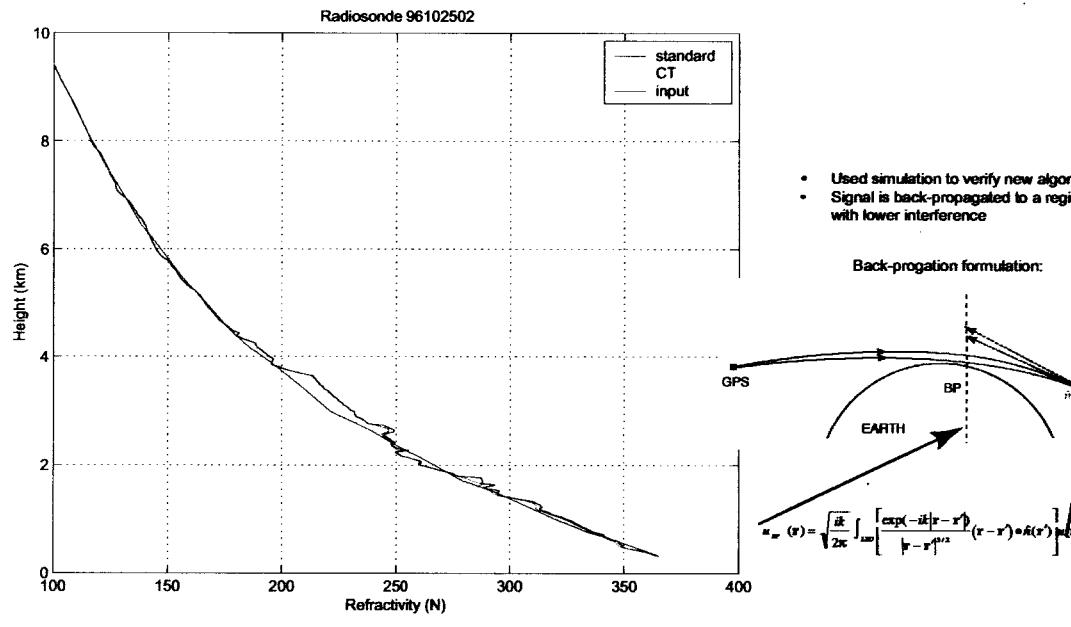
Mission	Launch	Comments
CHAMP	2000	Productive
SAC-C	2000	Productive
IOX	2001	Under evaluation for atmospheric occultations
GRACE	2002	Occultations expected in 2002
CNOFS	2005	Space weather focus – US Department of Defense
EQUARS	2005	INPE (Brazil) – proposed
COSMIC	2005	Six satellite constellation
METOP	2005	ESA
NPOESS	2009	NOAA
ACE+	20XX	ESA – selected Phase A
SBIRS Low	20XX	US DoD – 24 satellites – proposed

### Increasing the Number of Profiles: Receiver "Fly-Wheeling"



- Number of profiles in lower 1/2 km increased from 32% to 62%

### Increased Accuracy in the Lower Troposphere



# An Emerging New Direction in Remote Sensing for Earth Science:

## The Technology of GPS Occultations

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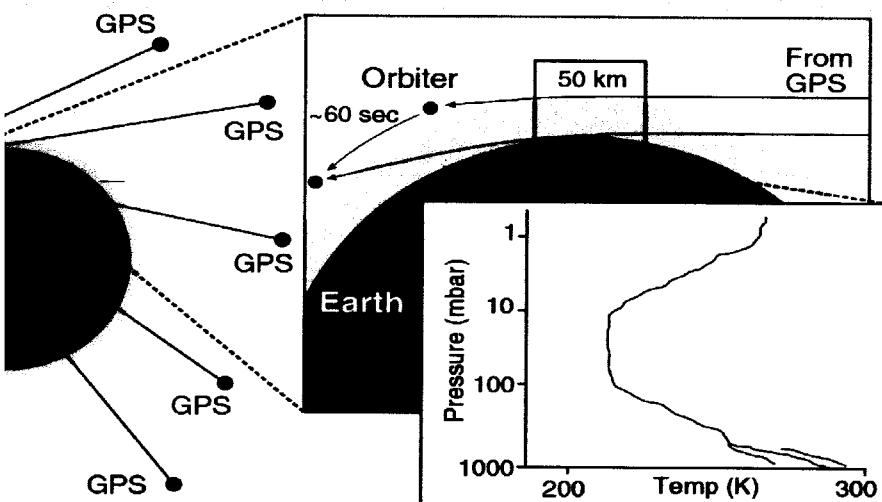
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Right receiver algorithms and new science

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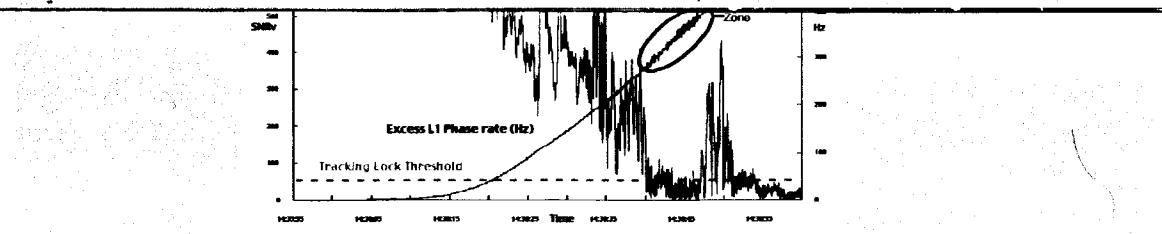
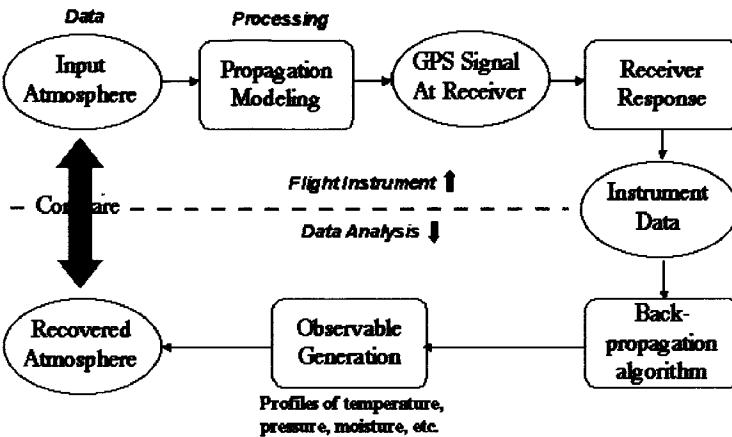
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*Increasing the Number of Profiles:  
Receiver "Fly-Wheeling"*

multiple local times

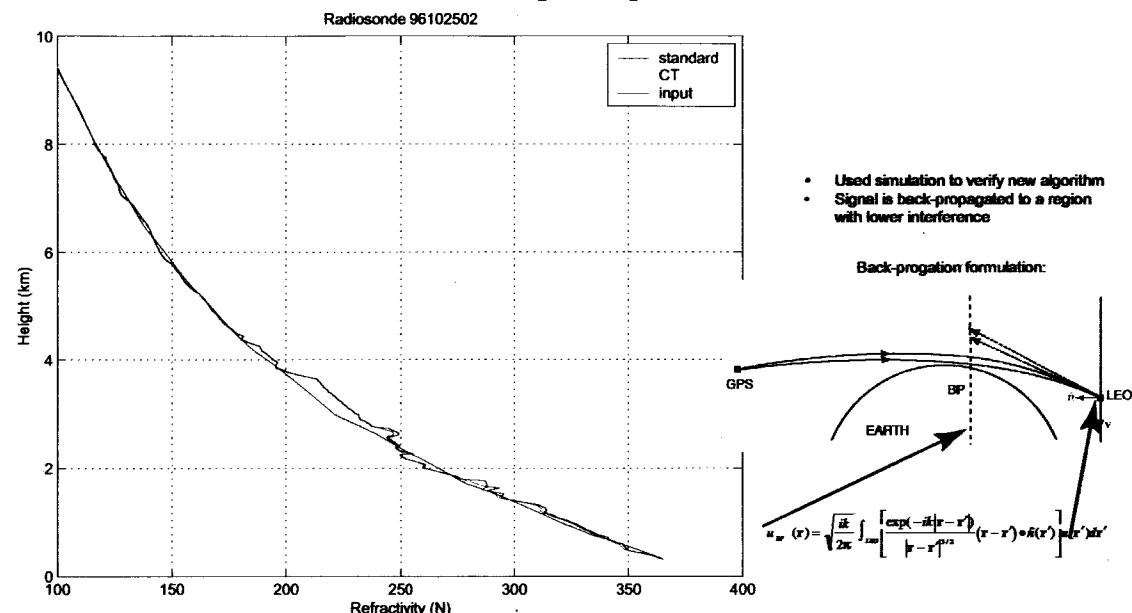
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### Acknowledgments

This research was carried out at the Jet Propulsion Laboratory, California Institute of Technology, under a contract with the National Aeronautics and Space Administration. Sponsorship of the Earth Science Technology Office is gratefully acknowledged.