CICERO: Community Initiative for Continuing Earth Radio Occultation

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A Paradox:

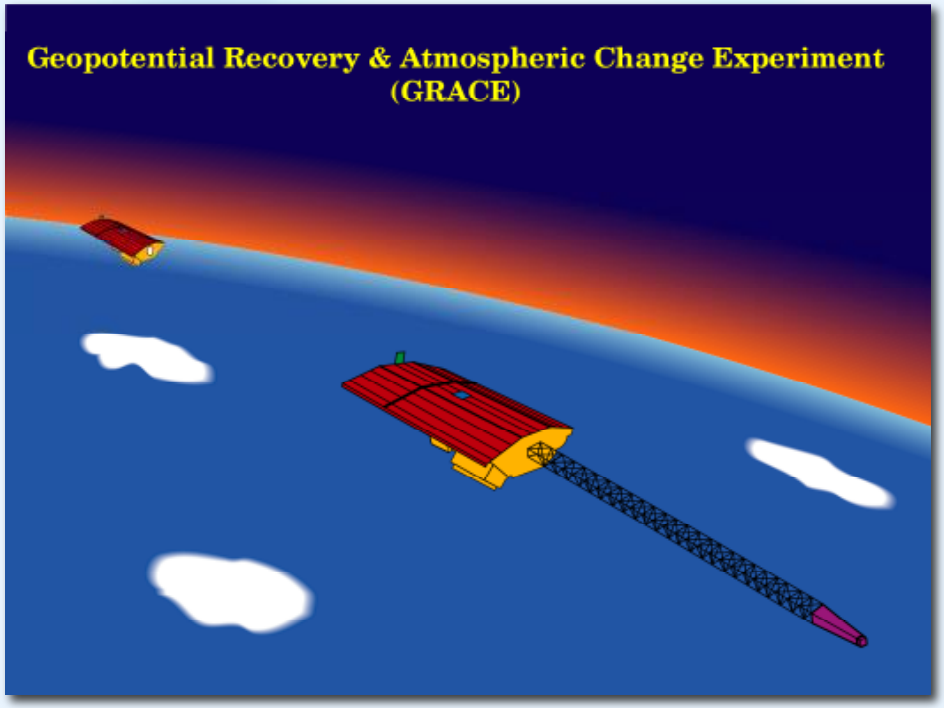
Satellite and space instrument costs have soared to staggering levels…

…while technology costs everywhere else have plummeted.

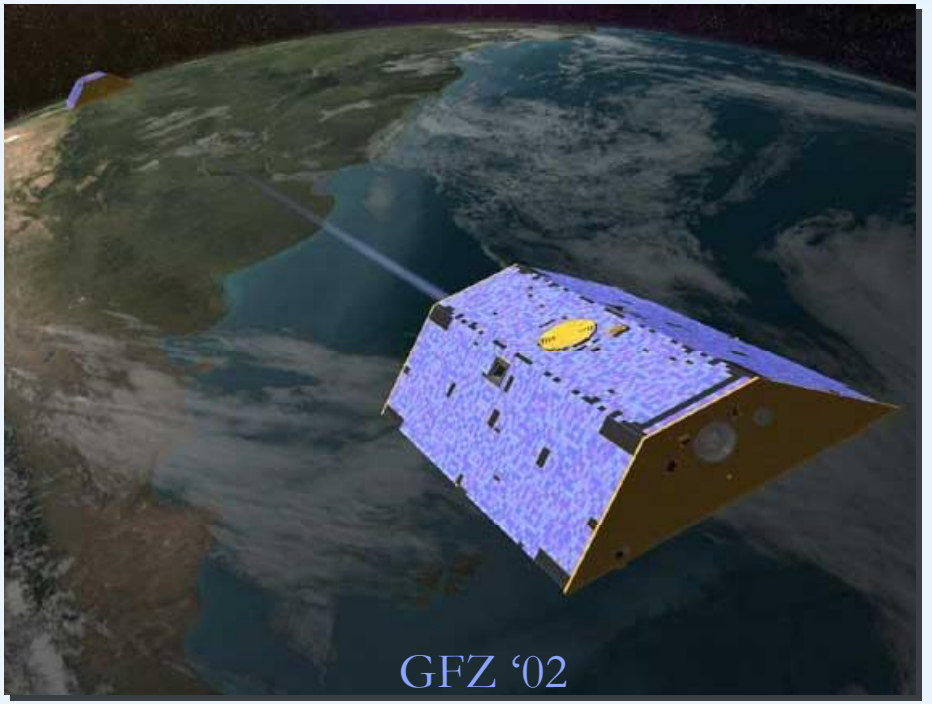
This trend is unsustainable…

…and is severely limiting the quantity and quality of environmental information we can acquire from space.

The GRACE Gravity Mission

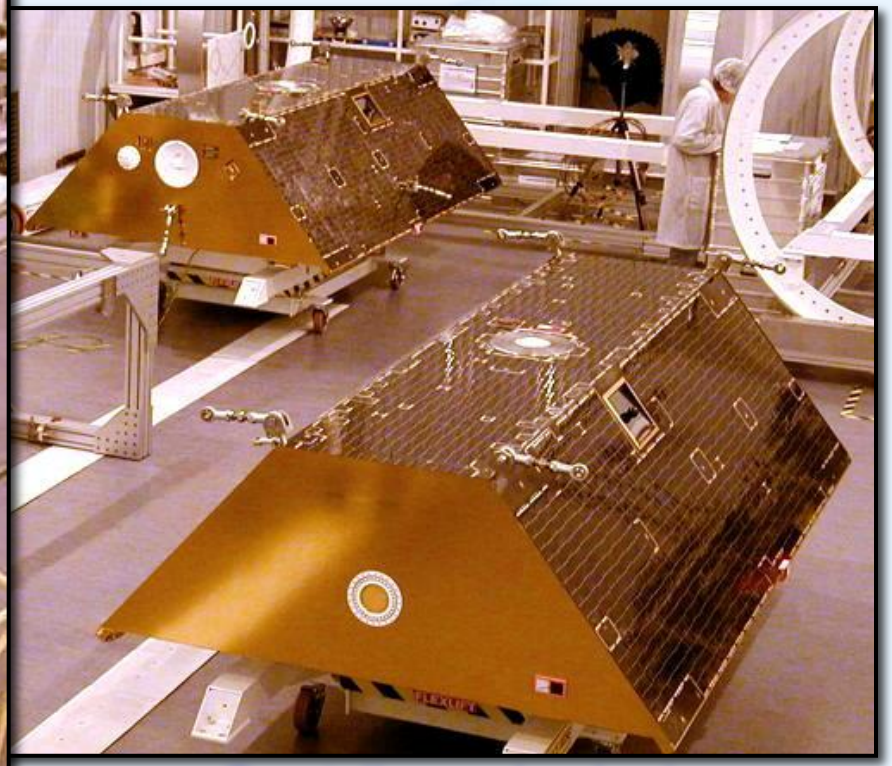


TPY sketch, Aug 1993



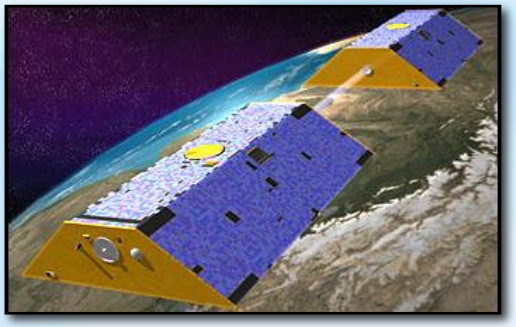
As flown, 2002

The GRACE Satellites



Cost (launch+1yr):
~$250M in FY11 $

What's Inside?



1. GPS Receiver
2. Three radio links
3. One-axis accelerometer
4. Three-axis gyros
5. Processor
6. 60 Mbytes data storage

1. GPS Receiver
2. Three radio links
3. Three-axis accelerometer
4. Three-axis gyros
5. Super-processor
6. 64 Gbytes data storage
7. Flux gate magnetometer
8. Color HD videocams (2)
9. HD multi-touch color display
10. Stereo speakers
11. Web browser/MP3…

Original Decadal Survey Price List (FY11$)

GRACE-II:

Repeat of GRACE

Heritage design

Heritage software

15y of tech advance

> Double GRACE-I

NASA Decadal Survey Mission	NASA's Est. Cost (FY11 M$)
CLARREO	492
SMAP	443
ICESat-II	683
DESDynI	855
HyspIRI	509
ASCENDS	532
SWOT	786
GEO-CAPE	1436
ACE	1832
LIST	686
PATH	
GRACE-II	**$530M**
SCLP	
GACM	1167
3D-WINDS	898
Total	**12013**

The NASA Decadal Survey Missions

"If you continue to run the cost of these missions up and the time to launch out, we're not going to do anything."

Berrien Moore, Co-Chair, NASA/NOAA Decadal Survey

NASA Decadal Survey Mission	NASA's Est. Cost (FY11 M$)	Recent	
~~CLARREO~~	~~492~~	~~900~~	+83%
SMAP	~~443~~	820	+86%
ICESat-II	~~683~~	700	+2.5%
~~DESDynI~~	~~855~~	~~1200~~	+40%
HyspIRI	509		
ASCENDS	532		
SWOT	786		
GEO-CAPE	1436		
ACE	1832		
LIST	686		
PATH	586		
GRACE-II	531		
SCLP	576		
GACM	1167		
3D-WINDS	898		
Total	**12013**		

"We may have been too optimistic in our cost estimates."

Richard Anthes, Co-Chair, NASA/NOAA Decadal Survey

A fundamental change is underway in government approach to space: *Commercial Solutions*

- Governments can't keep up with soaring costs:
  - NASA: 15 Decadal Survey missions ~$1B ea.; two will fly in 1st 12 yrs
  - NOAA: Next-gen polar weather sats (JPSS) ~$5B ea.; slipped ~8 yrs
- Solution: Private groups can do these at a fraction of gov't costs, and distribute cost among dozens of user nations.
- Example:
  - Private entity does a $1B NASA mission for $200M
  - Spread cost over 50 subscriber nations: $4M each
  - Spread cost over 8 yrs: $500K/yr each (less for most)
  - Many critical missions can now be accomplished
- Government labs might then become competitive (again)

About GeoOptics

GeoOptics was formed to implement this public-private model.

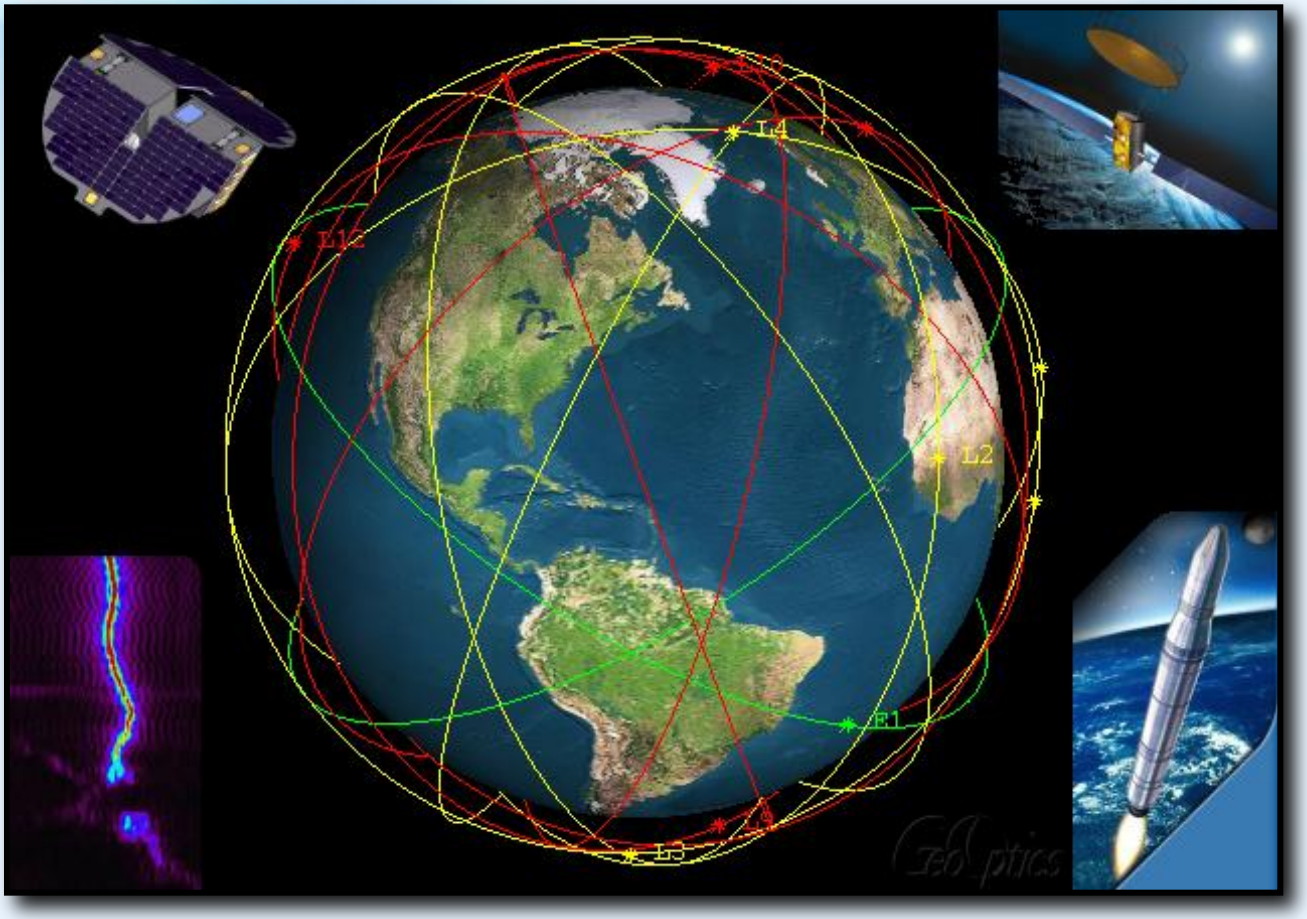
Our goal is to produce scientific data from space at the lowest possible cost…

…and distribute it as widely, freely, and quickly as possible.

We will do this by exploiting low-cost technologies and market efficiencies

(and by building a lot of our own stuff).

The CICERO Project



- 2 satellites: end 2013
- 12-satellites: mid 2015
- 24-satellites: mid 2017

Data Policy

- Data will be FREE to all researchers worldwide from day 1
- Data will be FREE to developing countries from day 1
- Data will be FREE to all countries on a trial basis for 3-6 months
- Data will be FREE to all countries once a “worldwide license” is fully subscribed
- A single agency can buy a worldwide license if they wish
- No up-front financial risk: pay on delivery of validated data

CICERO As A Community Cooperative

Scientists will serve the partnership directly:

- As Directors/Officers/Managers
- On the Science Advisory Board
- As research staff & in-country reps
- As technical consultants & data users

Working group organized at last summer's Shanghai workshop

To join mailing list, email: tom@geooptics.com

Benefits of the Public-Private Model

- Will deliver lots of new data quickly
  - at a minimal total cost
  - spread over many user nations
- Eases the agency approval process
  - different procurement processes
  - different pot of money (operations)
  - near-zero risk to government
- Will provide data indefinitely
- Offers built-in technology infusion path
  - launch every 4-6 months, each with:
  - 2 operational sats + 1 experimental sat
- Science community shares in decisions