



# Conventions, Modeling and Analysis The ILRS Experience and Perspective

Erricos C. Pavlis

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# Introduction

- Over the past 30 years Conventions and Standards in research were internationalized thanks to authorities such as the International Unions, Associations, and Engineering Societies
- Still a lot to be done to harmonize across disciplines, and especially across science and engineering, where there is usually a difference in the required level of accuracy for the end-product
- Geodesy and Geophysics are in a better position but there are still no Conventions and Standards adhered to by all
- We look at issues that ILRS had to grapple with and is still working on, and make suggestions where GGOS could/should play a role

# ILRS Practice

- ILRS has an Analysis Working Group which is the primary body that decides on CMA issues
- As a general rule, ILRS strives to follow the Conventions and Standards adopted by IERS
- If practically impossible, we quantify the consequences of any differences
- Since our science products are based on the combination of several individual AC results, we adopted a strict procedure for evaluation and validation of the s/w and analysis practice of any institution applying to join the AWG, since this is the focus of the CMA application

# Current ILRS AWG Structure

- The following six ACs comprise the AWG currently:
  - ASI, Italy (also primary CC)
  - BKG, Germany
  - DGFI, Germany (also back-up CC)
  - GFZ, Germany
  - JCET/GSFC, USA (also AWG Coordinator)
  - NSGF, UK
- Three potential ACs are undergoing benchmark tests:
  - GA, Australia
  - OCA, France
  - NU, UK

# Current AC s/w

- The s/w used by the six ACs are:
  - ASI, Italy
  - BKG, Germany
  - DGFI, Germany
  - GFZ, Germany
  - JCET/GSFC, USA
  - NSGF, UK
  - GA, Australia
  - OCA, France
  - NU, UK
  - GEODYN
  - UTOPIA (some version of)
  - DOGS
  - EPOS
  - GEODYN
  - SATAN
  - GEODYN
  - GINS
  - FAUST

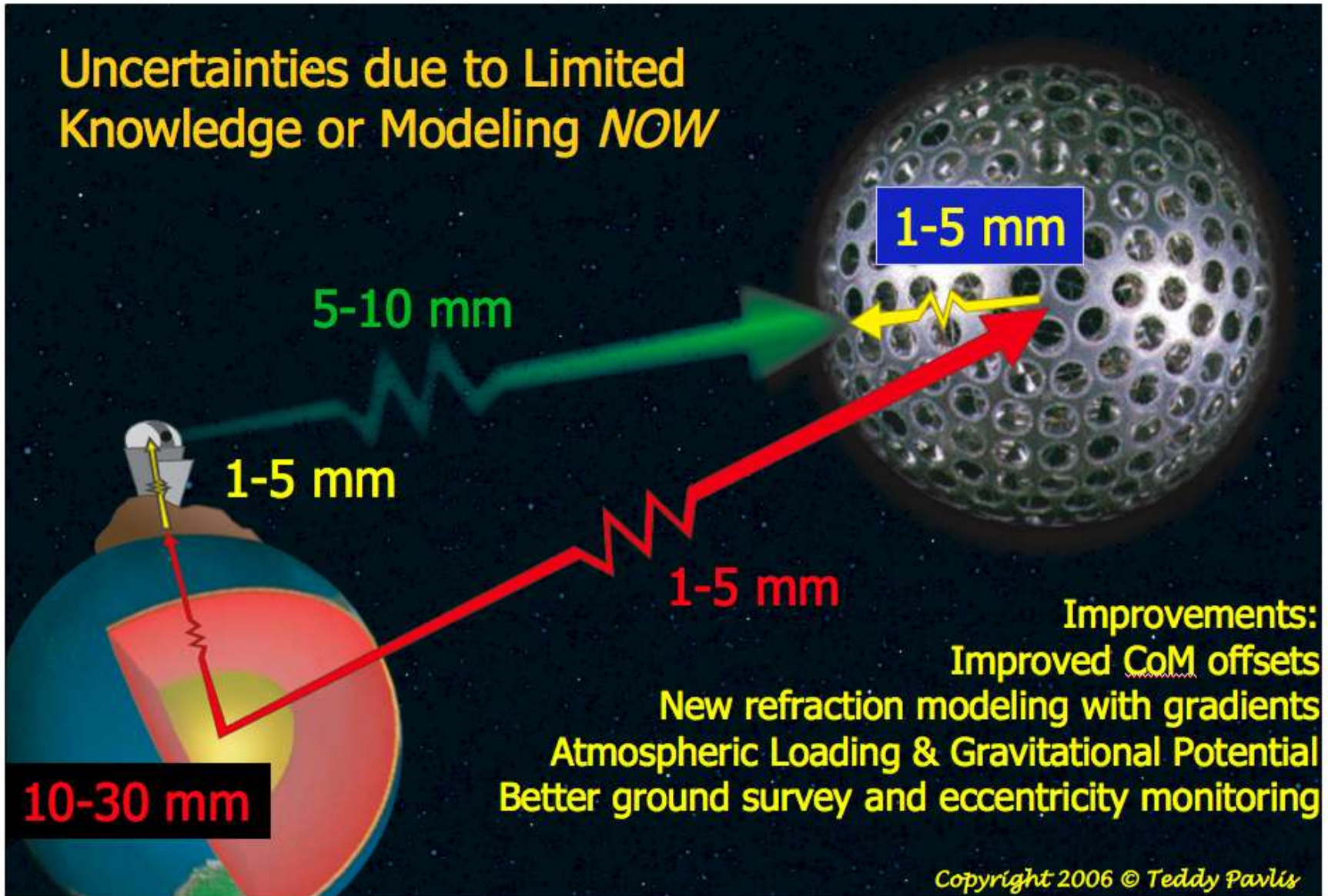
# Modeling Issues

- Using the same s/w does not guarantee same results
- Adopting same standards and conventions in s/w does not guarantee identical results either
- Implementation of certain models differs from one s/w package to another
  - GGOS can run a s/w comparison PP across techniques to validate consistency
- Not all techniques will assign the same priority in improving their modeling capabilities
  - GGOS again can play a role by coordinating and assigning priorities across techniques

# Analysis Issues

- Individual Analysis Centers are supported by national agencies/institutions and the availability for resources varies from case to case. So does the ability to stay in pace with advances in the technique, the models and the analysis procedures
  - GGOS can support ACs in their quest to solve these issues
- Space Geodesy data are very much like wine: the older they get, they more valuable they become. This improvement comes primarily through their repeated reanalysis with ever-improved models, constants and procedures which are the result of advances in science and engineering
  - To benefit from this, GGOS should coordinate consistent reanalysis of SG data sets whenever major advances in background models are reached (gravity, tides, dynamics, etc.)

## Uncertainties due to Limited Knowledge or Modeling *NOW*



**Improvements:**  
Improved CoM offsets  
New refraction modeling with gradients  
Atmospheric Loading & Gravitational Potential  
Better ground survey and eccentricity monitoring

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# “Outreach”

- Of all the IAG Services, only IGFS runs “summer schools”, essentially clinics where young scientists who aspire to join in this area of research, learn the practical aspects from experts who lecture for periods of about a week and provide on-hands experience with daily exercises
  - GGOS can design such courses at various levels, from the lowest (for the layman, as part of the Outreach WG), all the way up to “Continuing Education” level for the scientists themselves
- To some extent we need to educate the other disciplines about our products and the CMA we follow, in order that they make the correct and best use of these products
  - GGOS can organize these cross-discipline schools on some exchange basis so that our scientists can also attend similar schools organized by other G\*OS partners

# Summary

- Need to harmonize Conventions and Standards across disciplines - GGOS can provide a link to other G\*OS partners
- The experience of the IAG Services can be a starting point for intra-GGOS harmonization
- GGOS should coordinate with the Services and run a PP for s/w comparison at least for basic modules
- GGOS should establish a baseline of where each of the components stands with respect to CMA in practice
- Using its position within GEOSS and IGOS-P, GGOS can create outreach activities that will help familiarize all partners with the CMA and practices adopted by each group