NeQuick: In-Depth Analysis and New Developments

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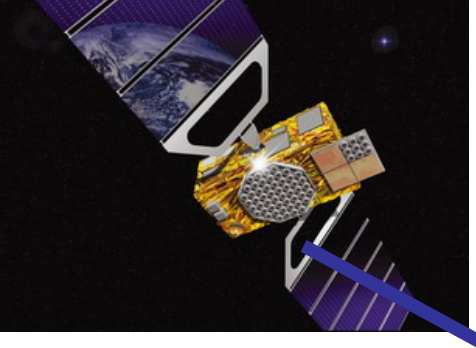

Ionosphere

Troposphere

1. Introduction

Why modelling ionosphere for GALILEO SF users?

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2. NeQuick

How modelling ionosphere for GALILEO SF users?

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3. Assessment and tools

Let’s assess NeQuick!

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How modelling ionosphere for GALILEO SF users?

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Let's assess NeQuick!

4. Profile analysis

What are the consequences of developments?

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Let's assess NeQuick!

4. Profile analysis

What are the consequences of developments?

5. Global analysis

Do they improve the global behaviour?

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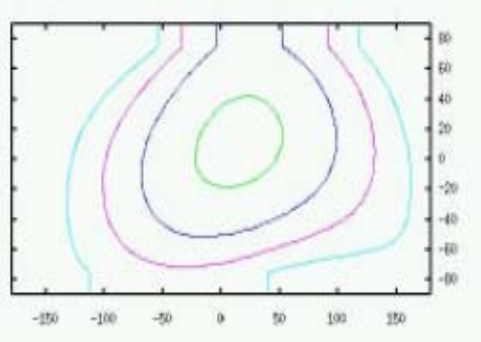
Ionospheric delay depends on TEC and frequency.

- Ionospheric delay = 40.3 * TEC / f^2
- f → need of model
  especially for single frequency users
- TEC → 1 TECu = 10^{16} el. m^{-2} ~ 0.16 m (L1)

1. Introduction

We want to improve its modelling for GALILEO.

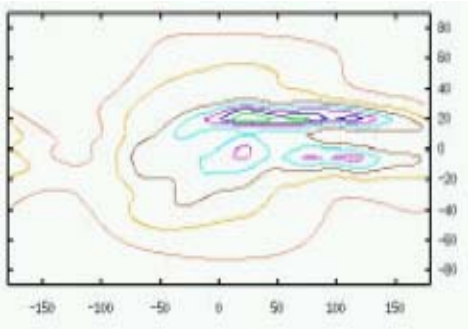
GPS: Klobuchar



vTEC
and obliquity factor

→ 50% RMS cor.

GALILEO: NeQuick



sTEC

→ 70% RMS cor. ?

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NeQuick is an empirical « profiler ».

- Output = electron density → integration
- Layer peaks = anchor points
  → monthly median CCIR maps
- Input = ionospheric variables such as solar flux

2. NeQuick

We will use it on a daily basis.

- Monthly flux replaced by daily parameter (Az)

Measure sTEC

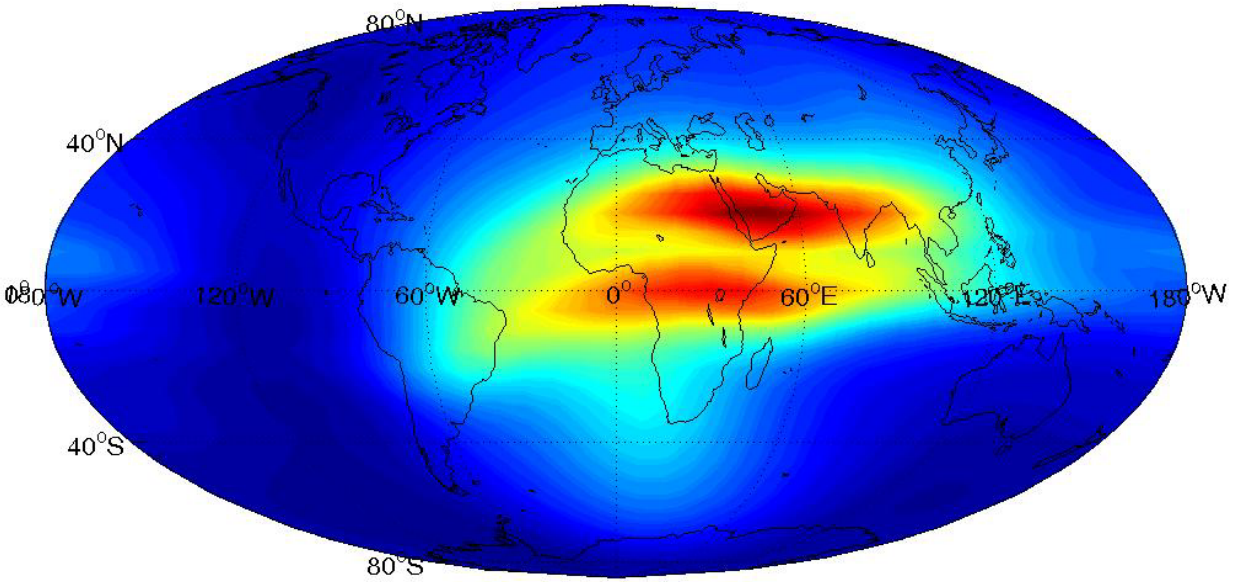
Optimize Az

Run NeQuick

2. NeQuick

We need to investigate some problems.

- Modelled TEC too high at equator
- (



- Topside?

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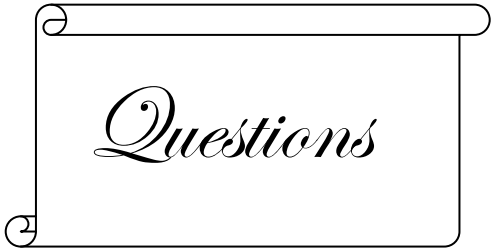
3. Assessment and tools

We drew a list of questions.

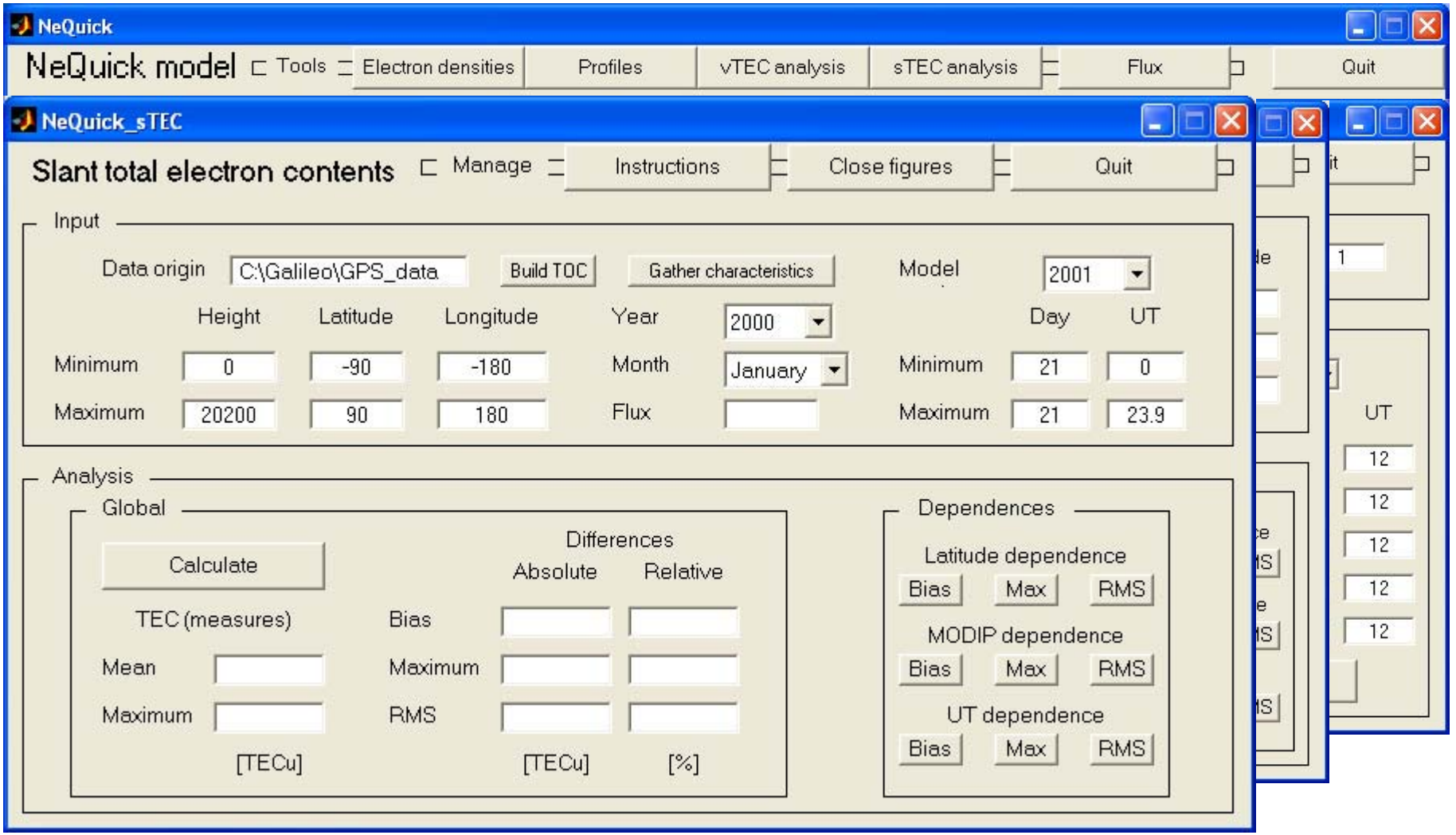
- Understand NeQuick



- Improve physical behaviour
- Effective use
- Implementation

3. Assessment and tools

We built tools to show potential improvements.



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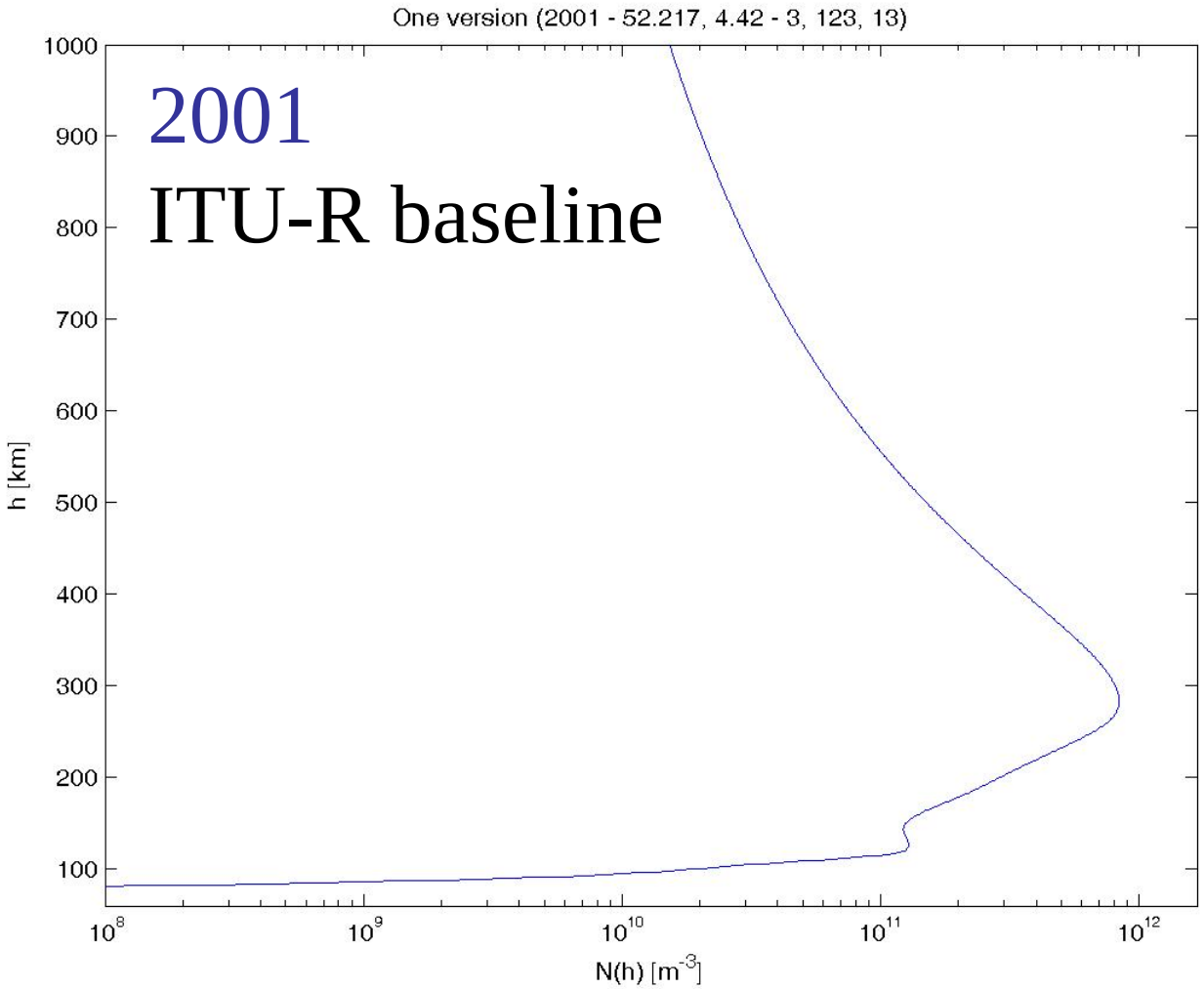
4. Profile analysis

We studied the latest evolutions.



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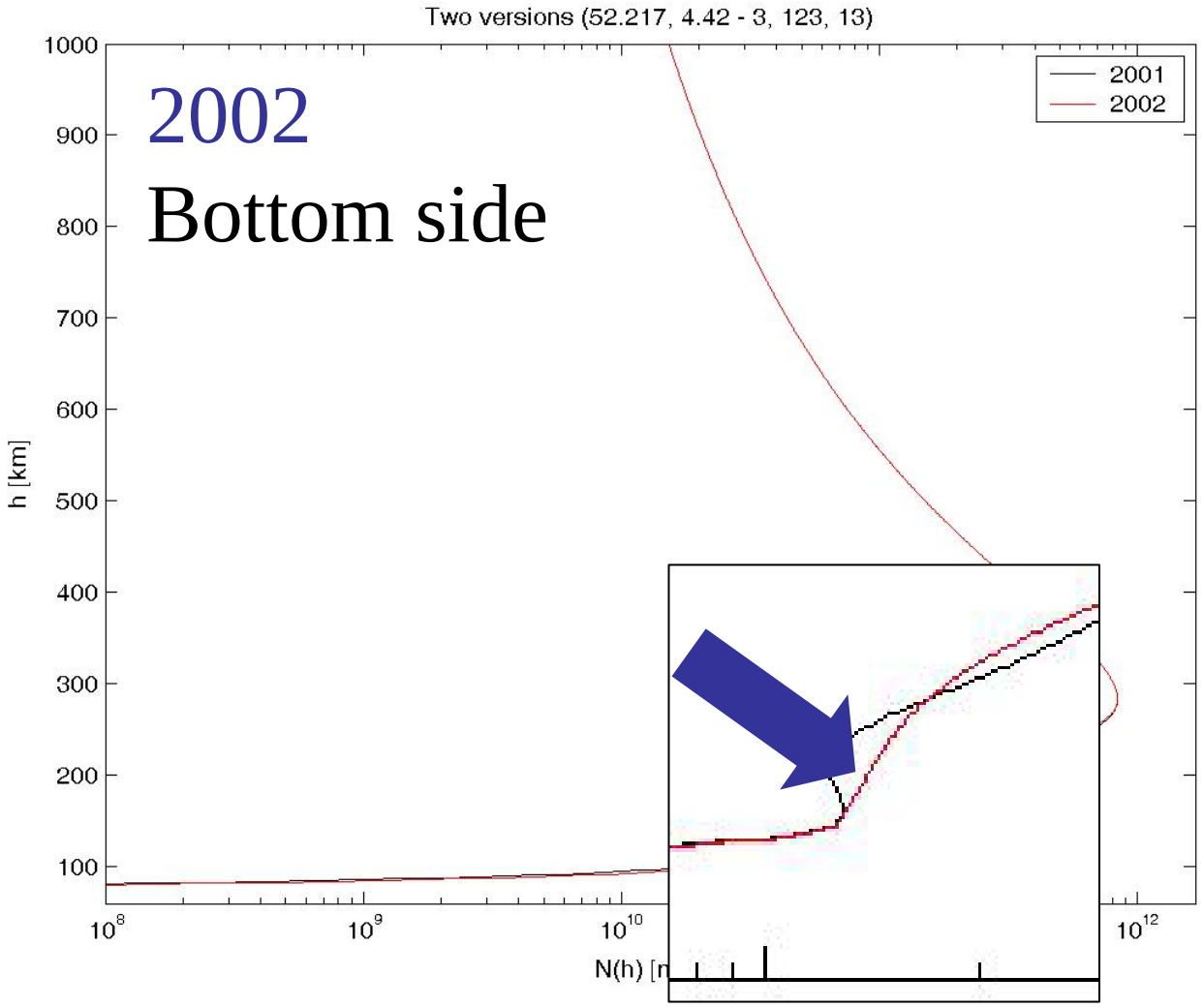

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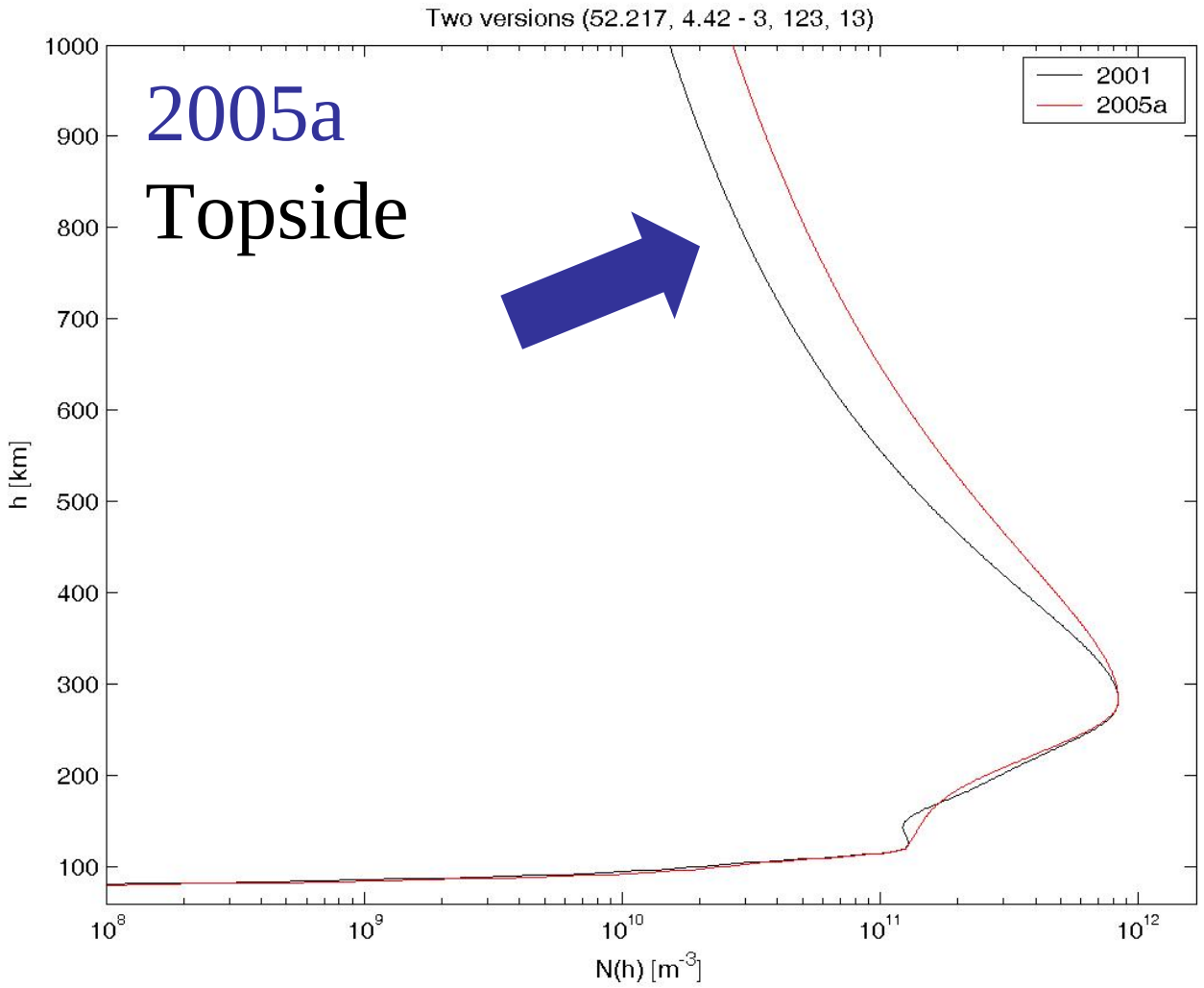

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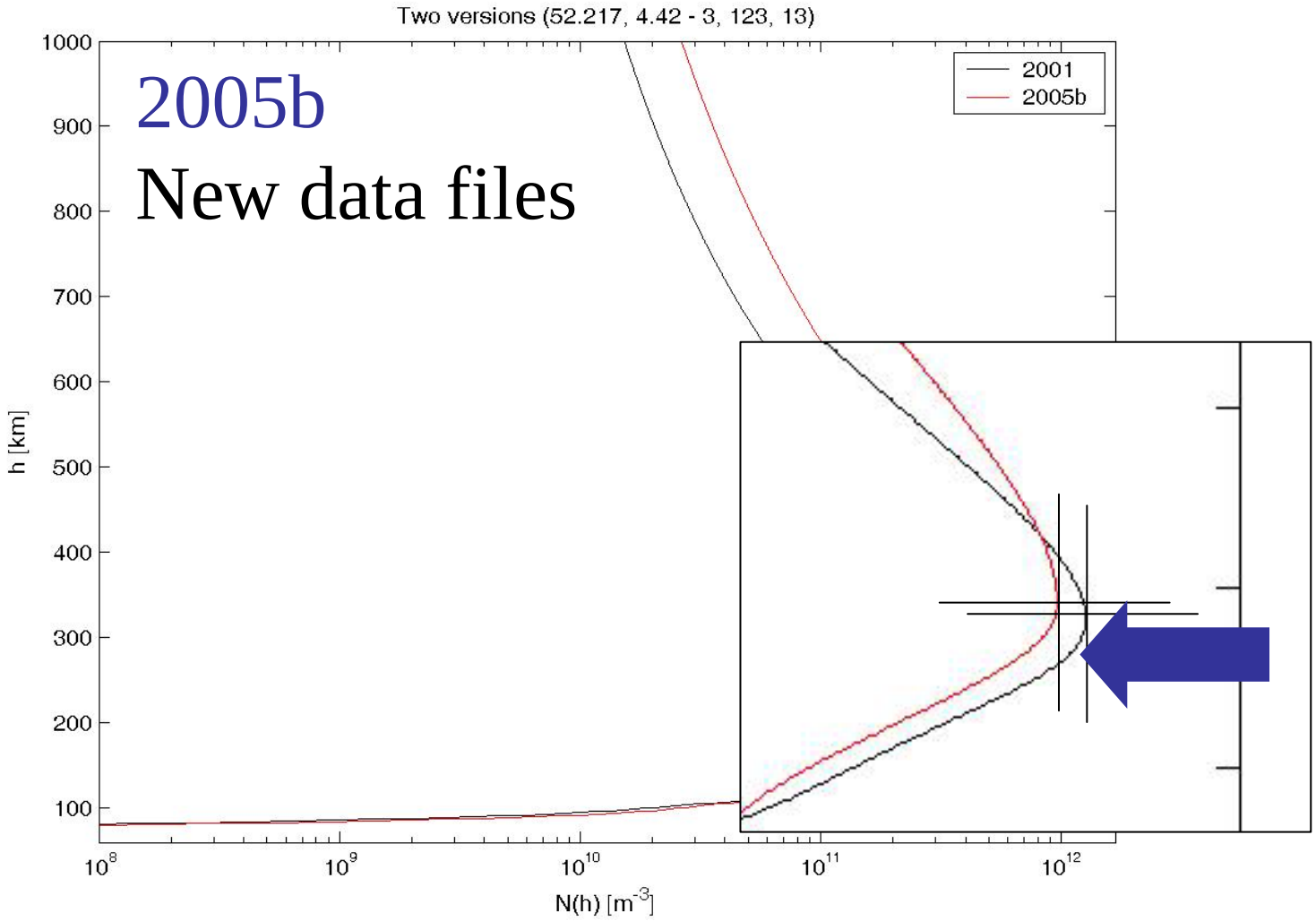
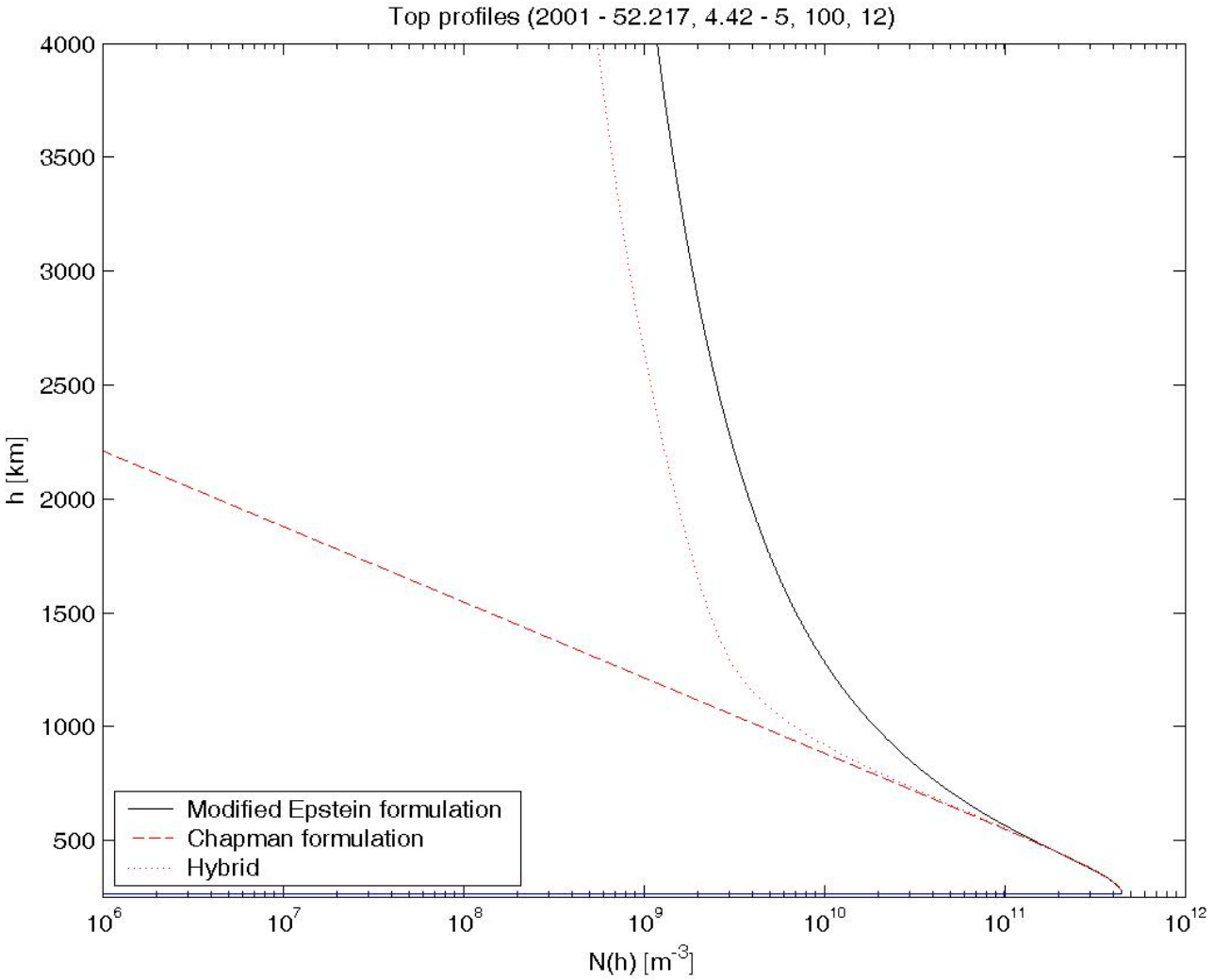


2005b

New data files

4. Profile analysis

As an example, we proposed a topside modification.



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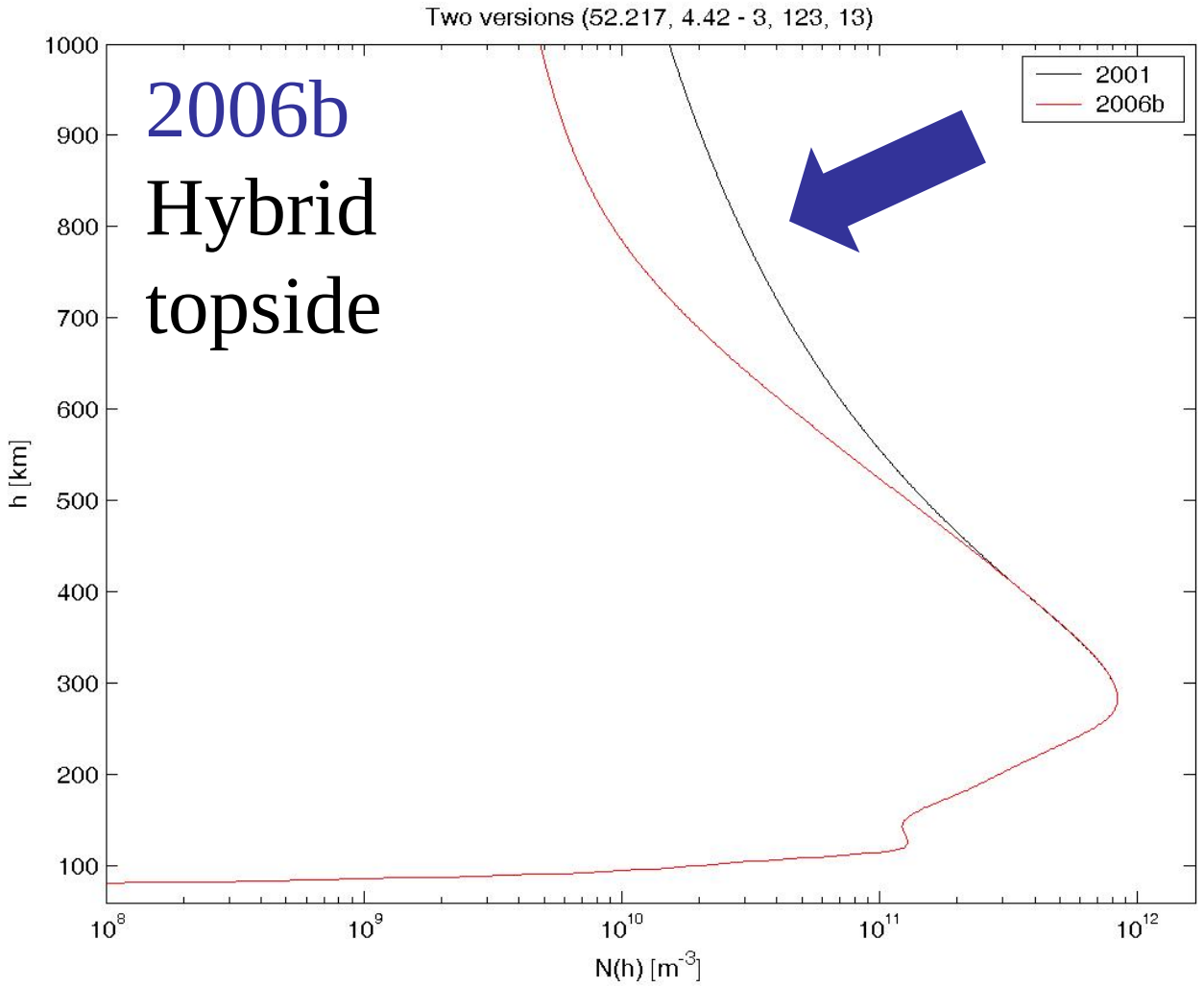

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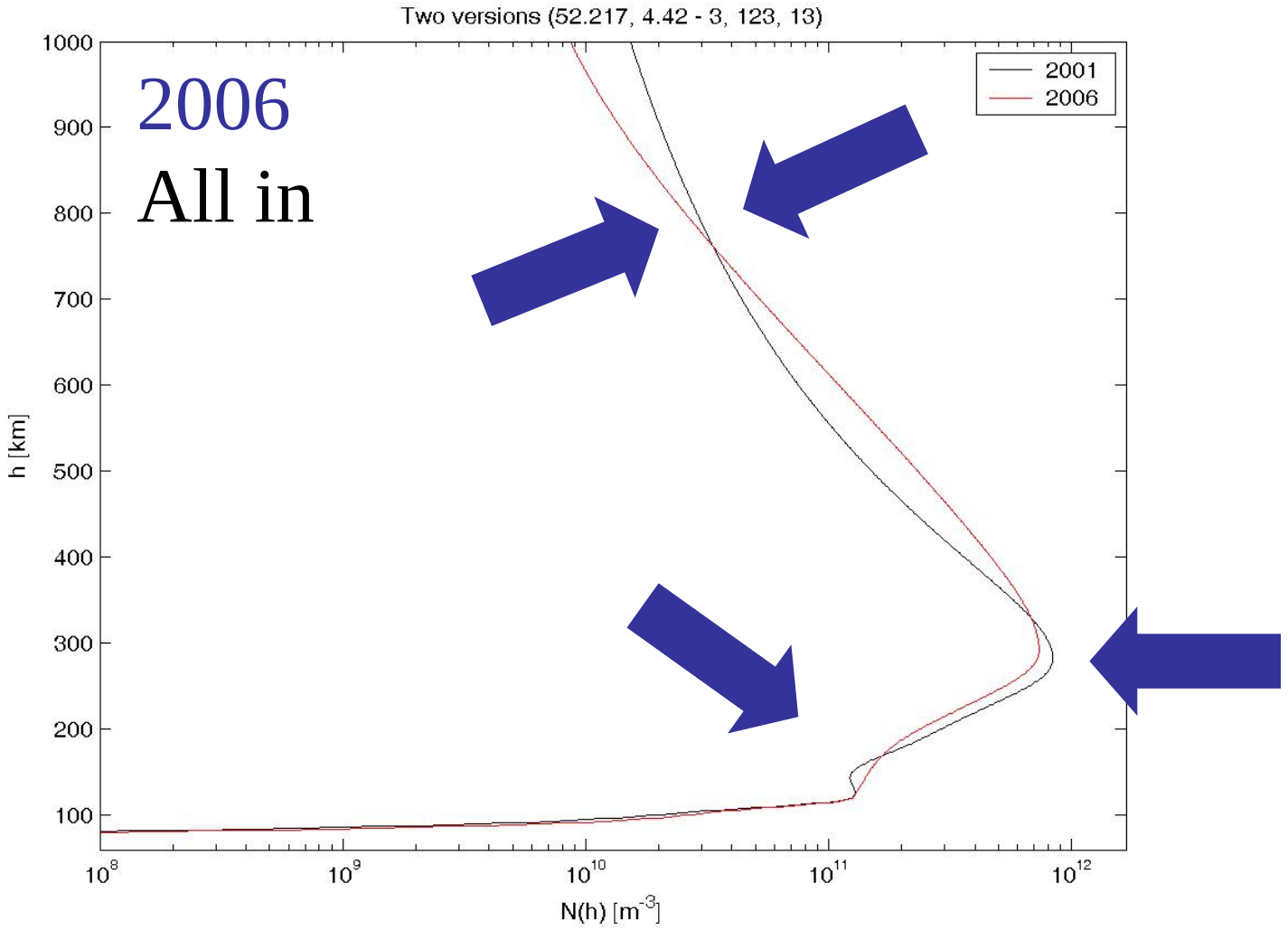

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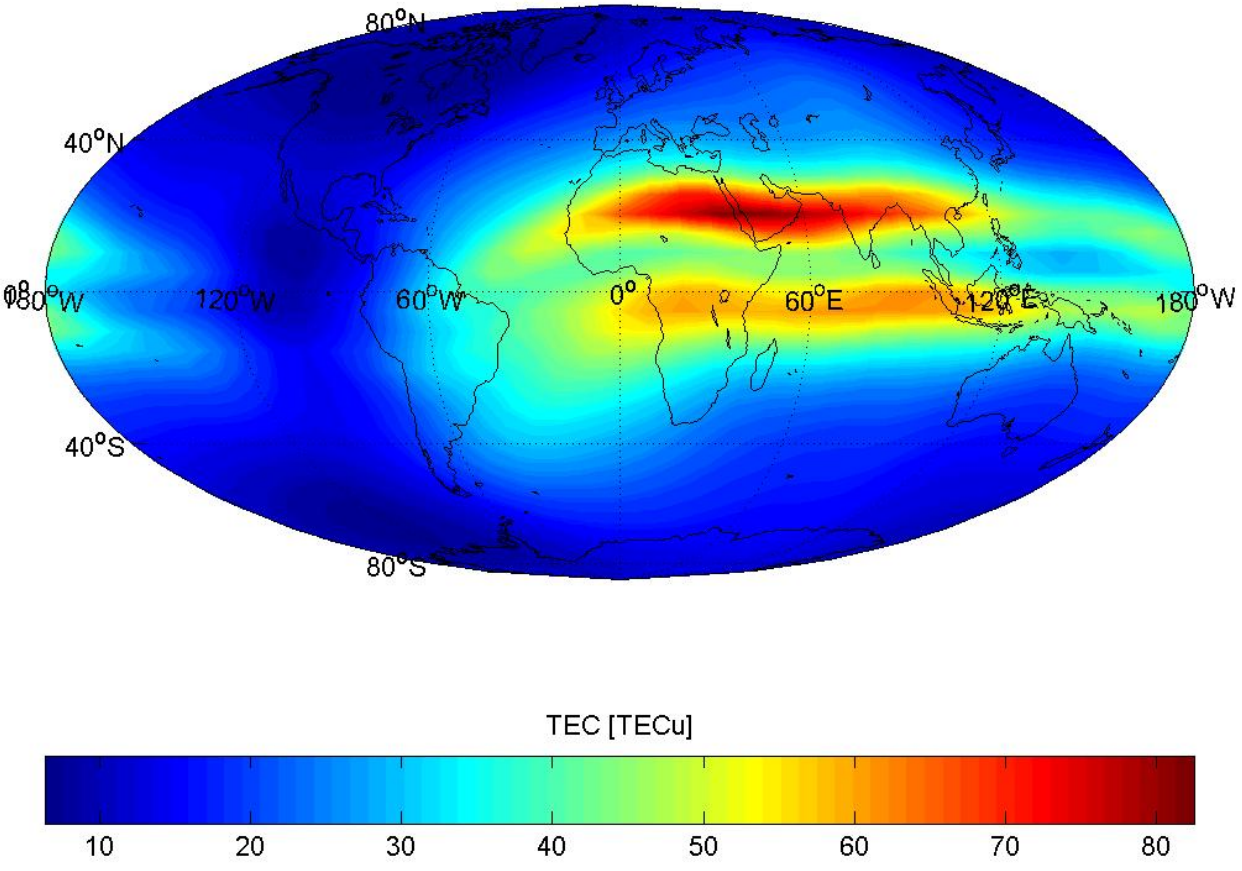
5. Global analysis

We analysed the global evolution on vTEC maps.

2001

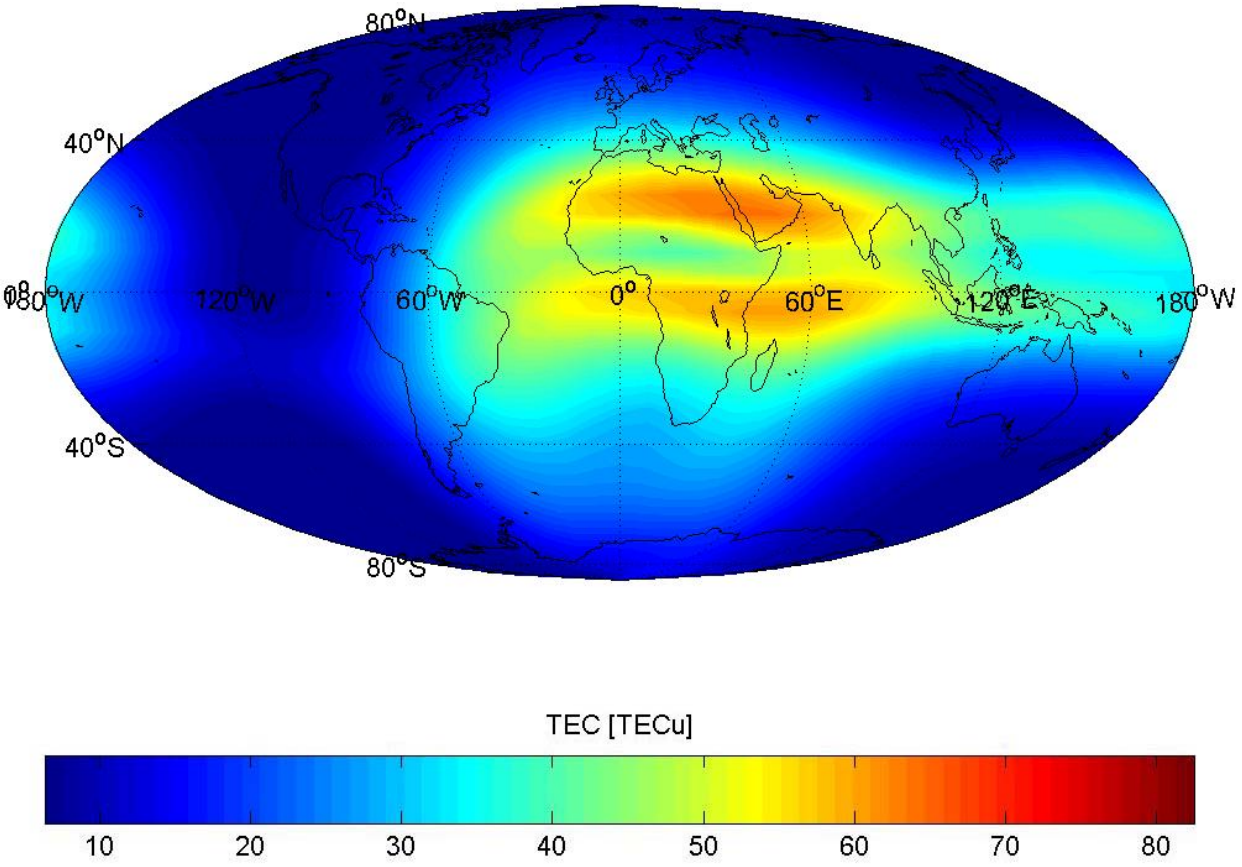


Max = 82

5. Global analysis

We analysed the global evolution on vTEC maps.

2005b

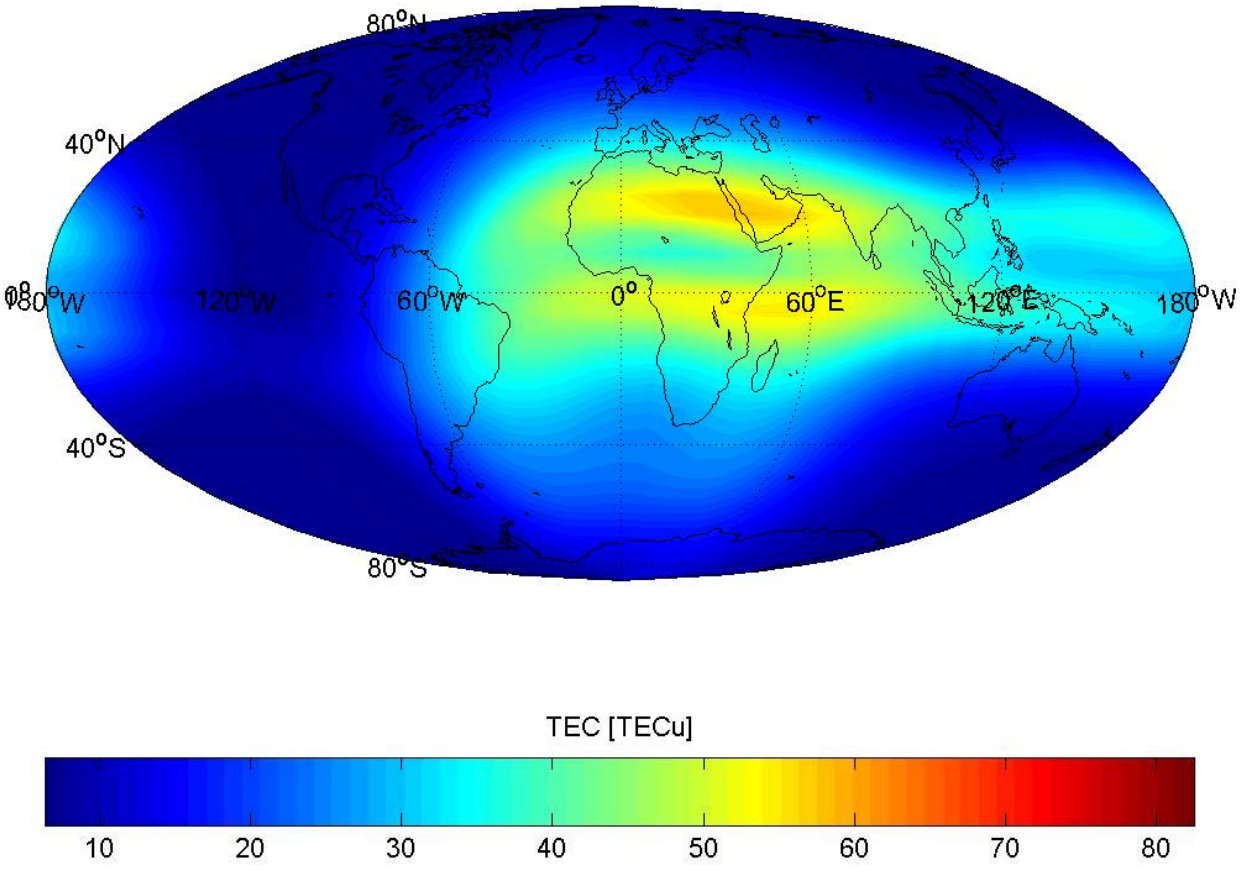


Max = 65

5. Global analysis

We analysed the global evolution on vTEC maps.

2006



Max = 58

5. Global analysis

We compared measured and modelled sTEC values.

<sTECmeas> = 31 TECu	Bias (TECu)	RMS (TECu)
2001	-1.58	8.24
2005b	2.88	9.80
2006	0.25	10.00

We have now a complete basis…

- Integrated evolution understanding
- Potential improvements list
- Test tools
- First results

… to be continued…

- Broader physical behaviour analysis
- Topside

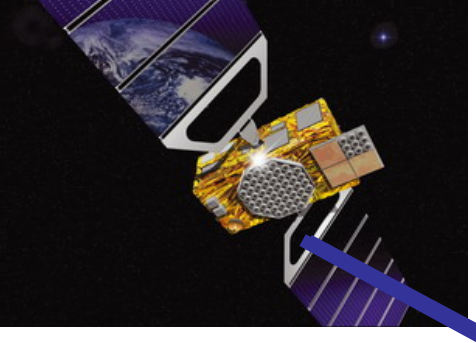
- Az calculation method
- Effective use analysis

- Implementation

… through a PhD thesis!

- PhD thesis at ULg - Geomatics
- Work with René Warnant's team

  at Royal Meteorological Institute (Brussels)
- Contacts:
  - ESA/ESTEC
  - model conceptors (ARPL – Trieste)



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