



# Science Cases for the Atmosphere Node

A. Sarkissian, G. Chanteur, O. Dutuit, P. Pernot  
E. Chassefière, F. Forget, S. Lebonnois, F. Leblanc  
and colleagues from Pole Systeme Solaire at IPSL



3 Existing (but not online) sciences cases BDAP

2 Sciences cases IDIS Atmospheres node



# Science Case 1

## Massive Asteroid search with Digitized First Byurakan Survey

### Collaboration With Byurakan Observatory and IMCCE (OBSPM)

FBS: Objective prism  $1.5^\circ$  on 1m Schmidt telescope, 1700 fields of views ( $1^\circ \times 1^\circ$ )

performed from 1965 to 1980 at Byurakan Observatory, Armenia

DFBS: Digitized Spectral Data Base of FBS, Low resolution spectra 300 - 690 nm

At OBSPM: Internet access (**restricted**) for 1400 plates (70%).

**More than 20 000 000 spectra should be soon on line with SSA and/or SIA !!!**



# BDAP Science Case 2

## 10 years of atmospheric H<sub>2</sub>O in Elodie Spectra

### Collaboration with Denver University

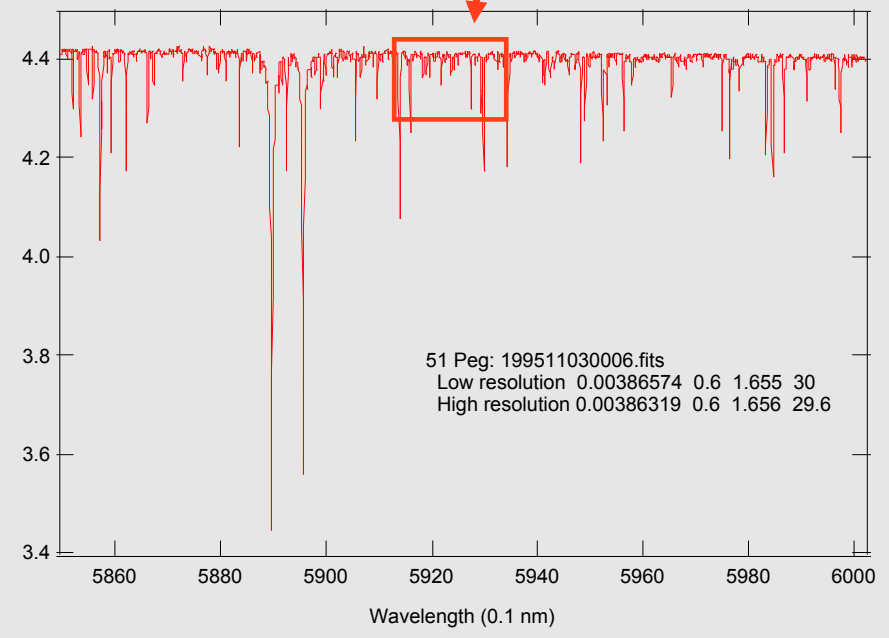
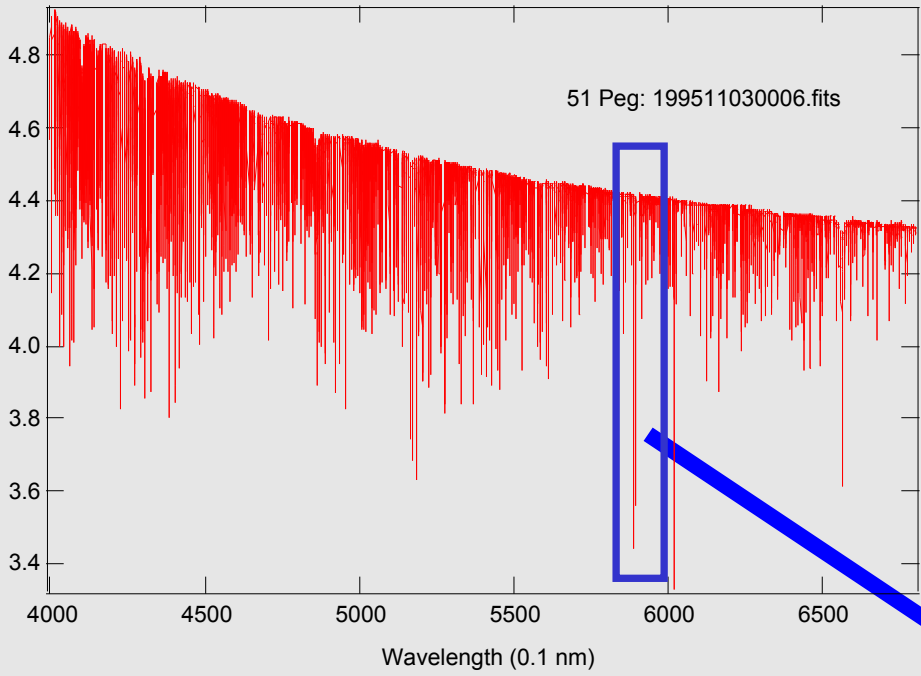
**Goal : To measure H<sub>2</sub>O in existing spectral data sets**

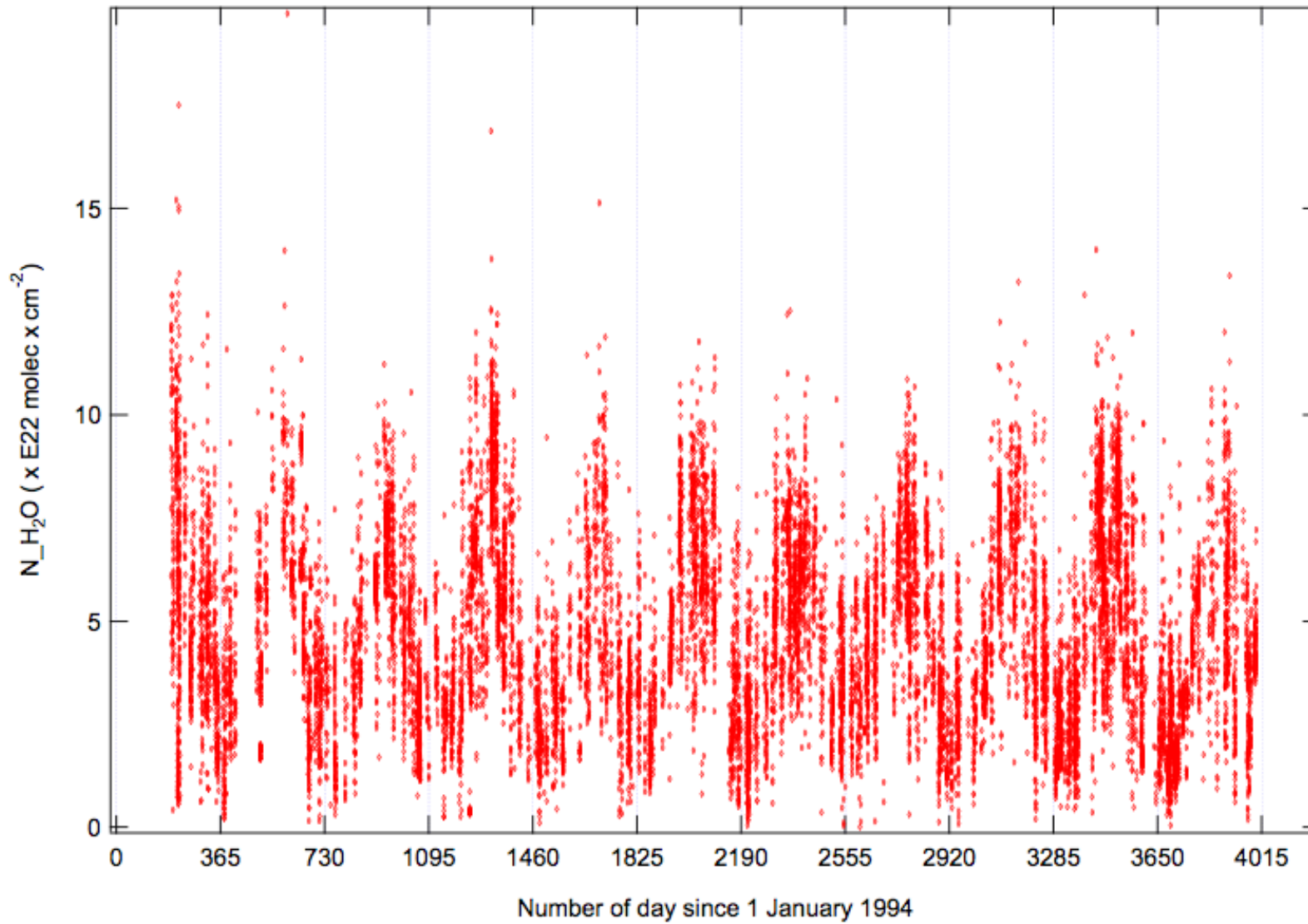
A lot of spectrometric observations started -80 years ago in astronomy

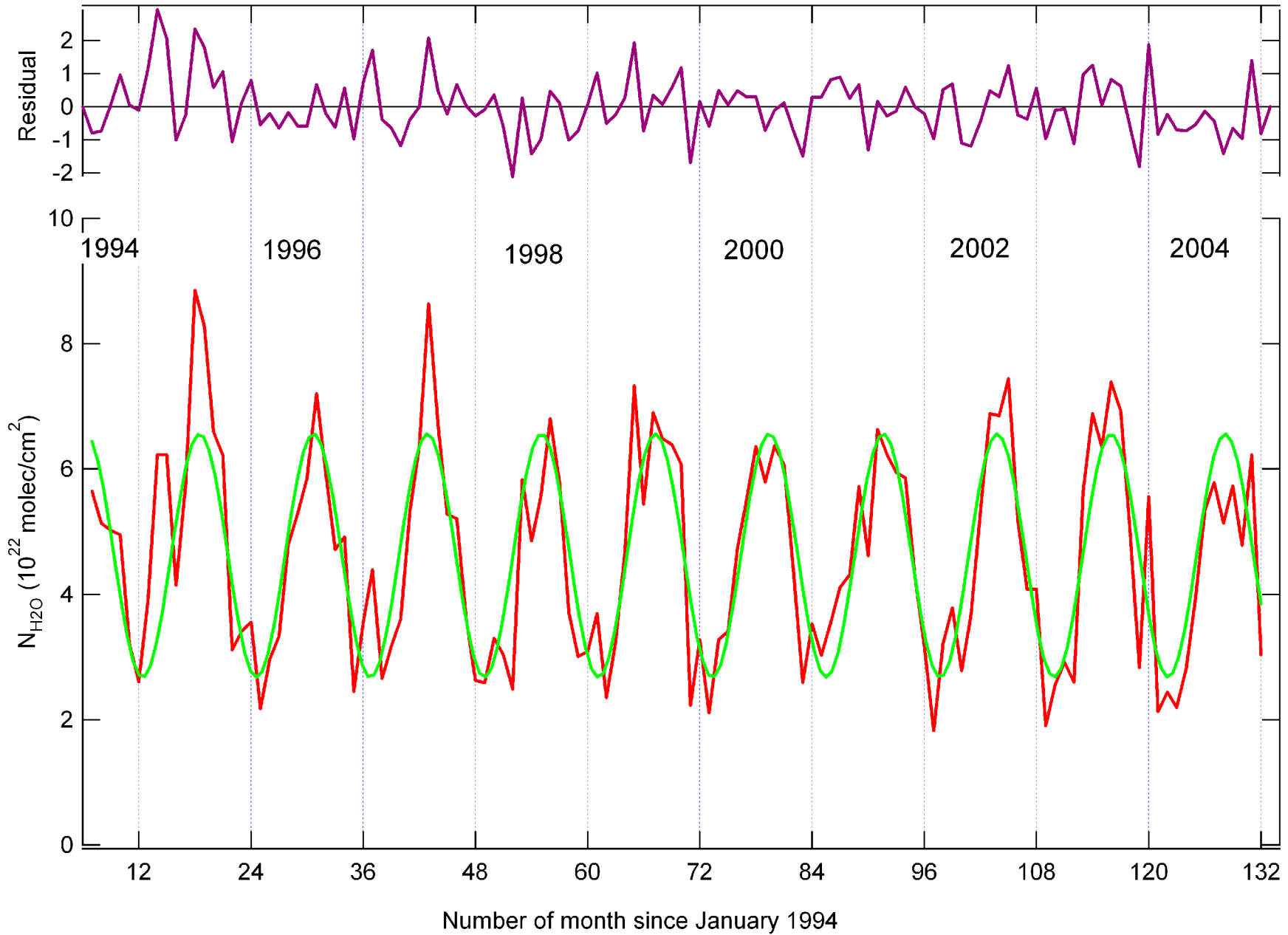
Important issue in modern atmospheric science because

Climate change

Ozone hole and ozone reduction







# BDAP Science Case 3

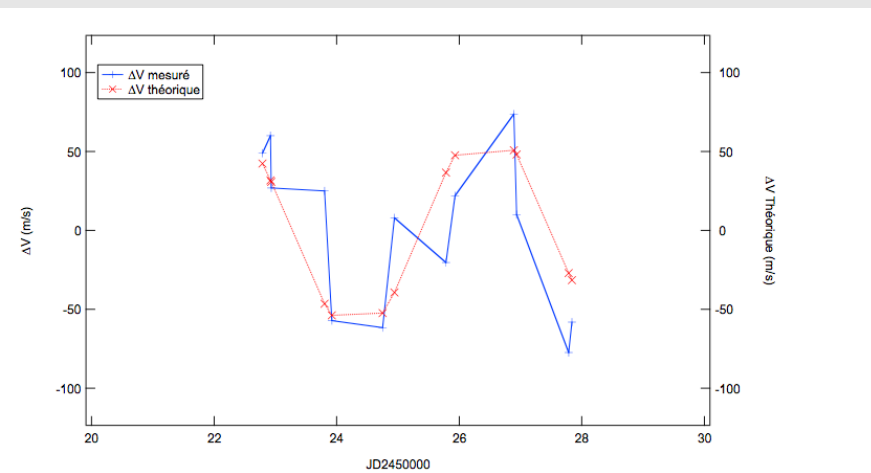
Exoplanet search from spectral data bases (Elodie, OHP)

Workflow for simple and fast spectral shift measurement

Spectral shift calculation applied on all spectra of Elodie

To look for signatures similar to those of the radial velocity method

Application on 51 Peg  
(exercise for student):





# Science Case 4

## Atmospheric Node science case 1

Europlanet science case for the Node Planetary atmospheres

Titan Ion-Neutral chemistry: understanding observations and constraining models

Collaboration with Oxford University (UK)

Web Service

<http://www.lcp.u-psud.fr/Pageperso/pernot/N7.html>

# Science Case 1: Titan Ion Chemistry

## Problem description

1. CASSINI/INMS observations of Titan upper atmosphere indicate the presence of ion and molecules which were not expected:
  - which are the key ion-neutral reactions?
  - what are the roles of transport and dynamic?
  - which is the main driver: photons, electrons...?
2. Coupling of a complex chemistry model with even 1D transport model is difficult: it is essential to identify key reactions to mimic the composition of Titan ionosphere. Studies of sensitivity are the methods to do so. We need to integrate reaction rates... and their measurement uncertainties.

[Presentation Berlin 2006](#)

## Cassini Data

Links to Cassini data servers

Needs access/decoding procedures !

Published data should be available as text files...

- [CASSINI MAPSExplorer](#)
- [Sample Ion Mass Spectrum](#)
- [PDS Data for Cassini INMS](#)
- [PDS Data for Cassini CAPS](#)

## Models and models outputs

Not many model results compilations

## Models and models outputs

Not many model results compilations

No calculation server (tmhk)

Negative ions ???

- [Cassini's Titan Tour](#) (A. Brecht)  
Outputs of Fox-Yelle model along Cassini trajectories.

### Energetic fluxes (electrons, photons)

### Neutral densities

### Physical-chemistry databases

- [ION chemistry database](#)
  - **Content:** Ion-molecule reaction rates and branching ratios
  - **Creator(s):** V.G. Anicich (JPL, retired)
  - **Comments:** List of reactions used by R. Yelle and V. Vuitton in their model of Titan ionospheric chemistry
  - **References:** McEwan & Anicich (2007, Mass Spectrometry Reviews 26, 281-)
  - **Medium:** ".csv" file
- [OSU chemical database](#)



# Science Case 5

## Atmospheric Node science case 2

Collaboration with LMD

Mars atmosphere measured by Spicam and GCM visualisation tool

Web Service