

A confidence index for the forecasting of the meteor showers

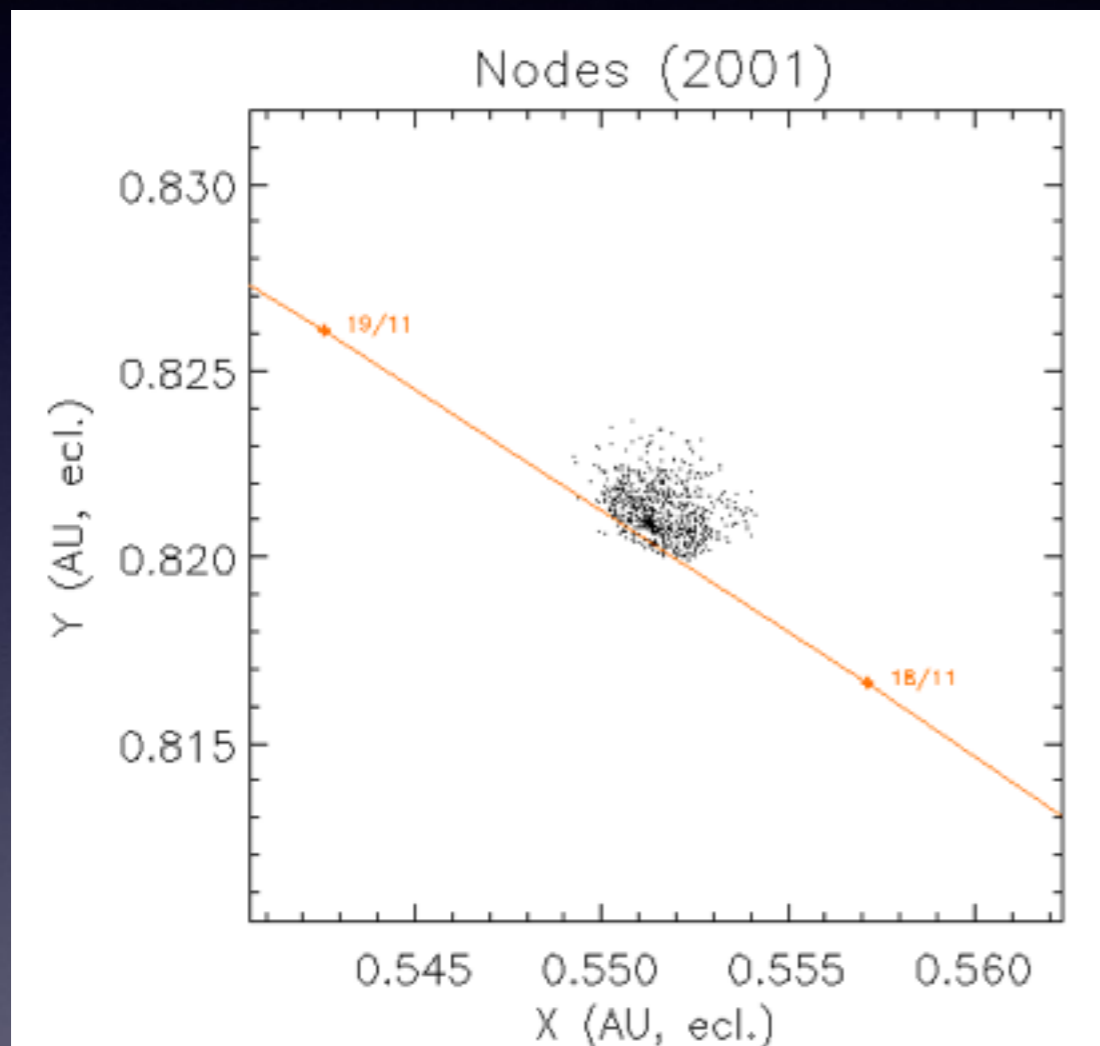
Jérémie Vaubaillon
IMCCE

Meteoroids 2016 conference

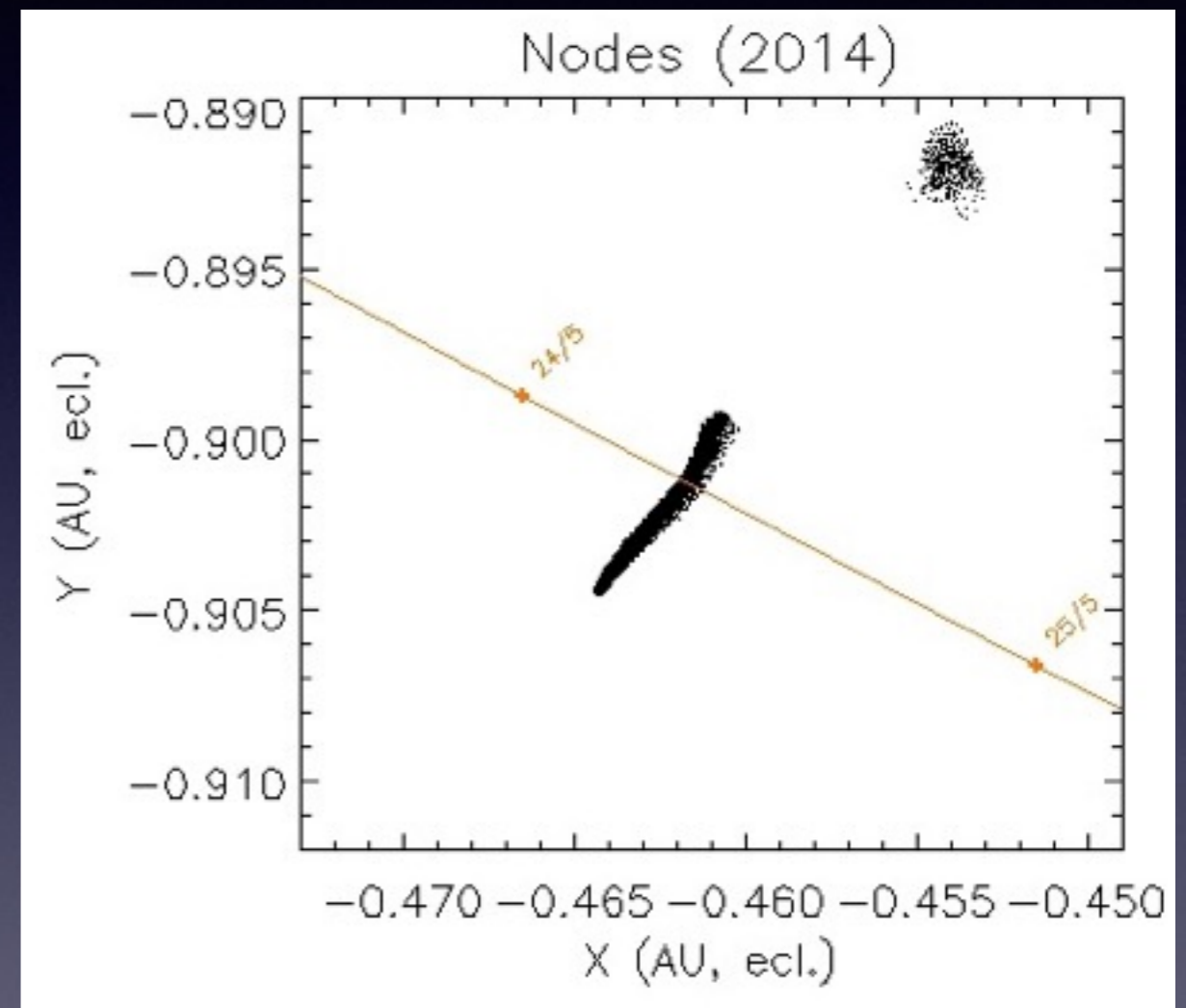
Outline

- The problem
- Towards a solution
- Recap of the confidence index

Prediction of meteor showers: best and worse of

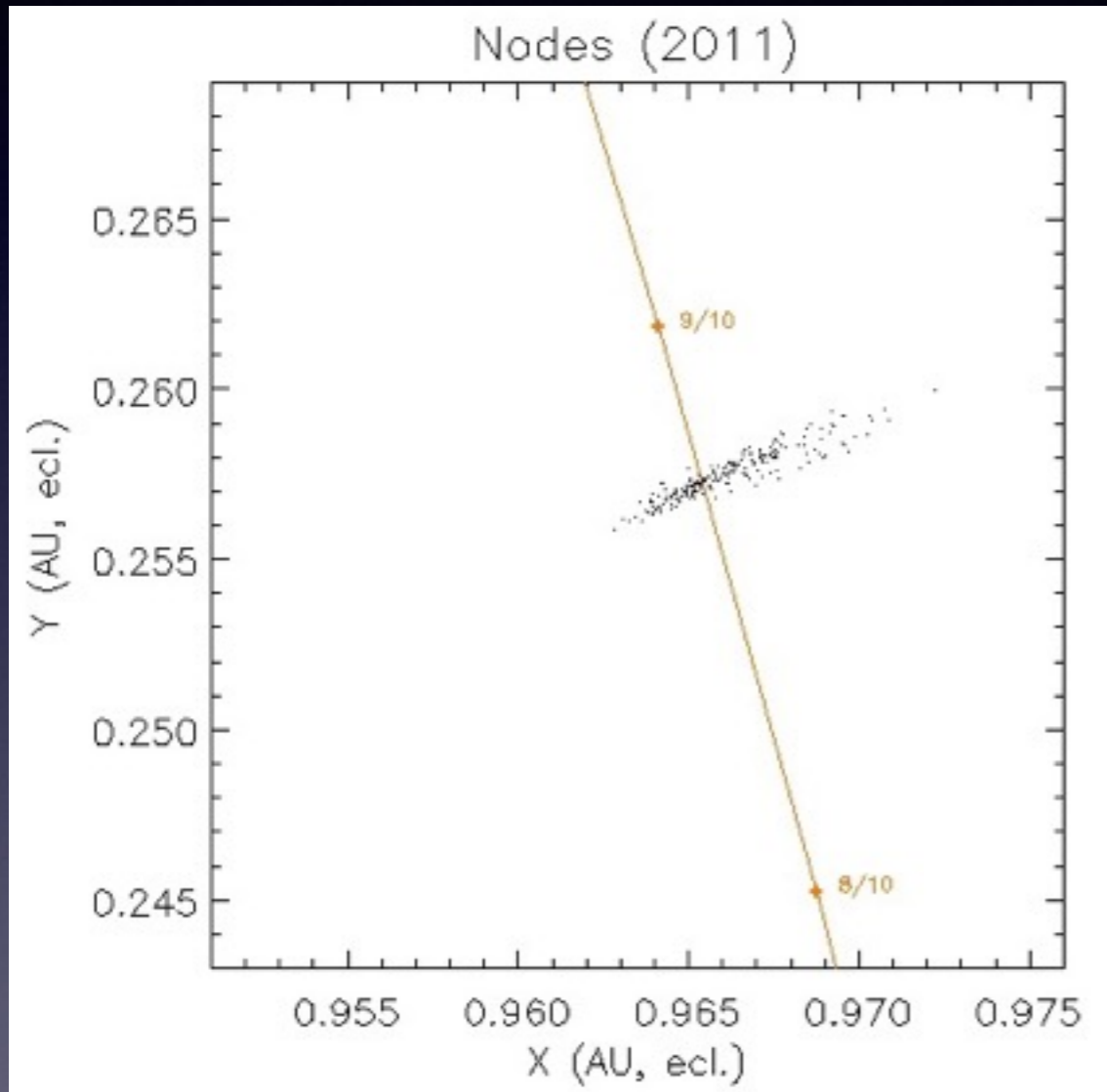


Leonids 2001
1767 Trail

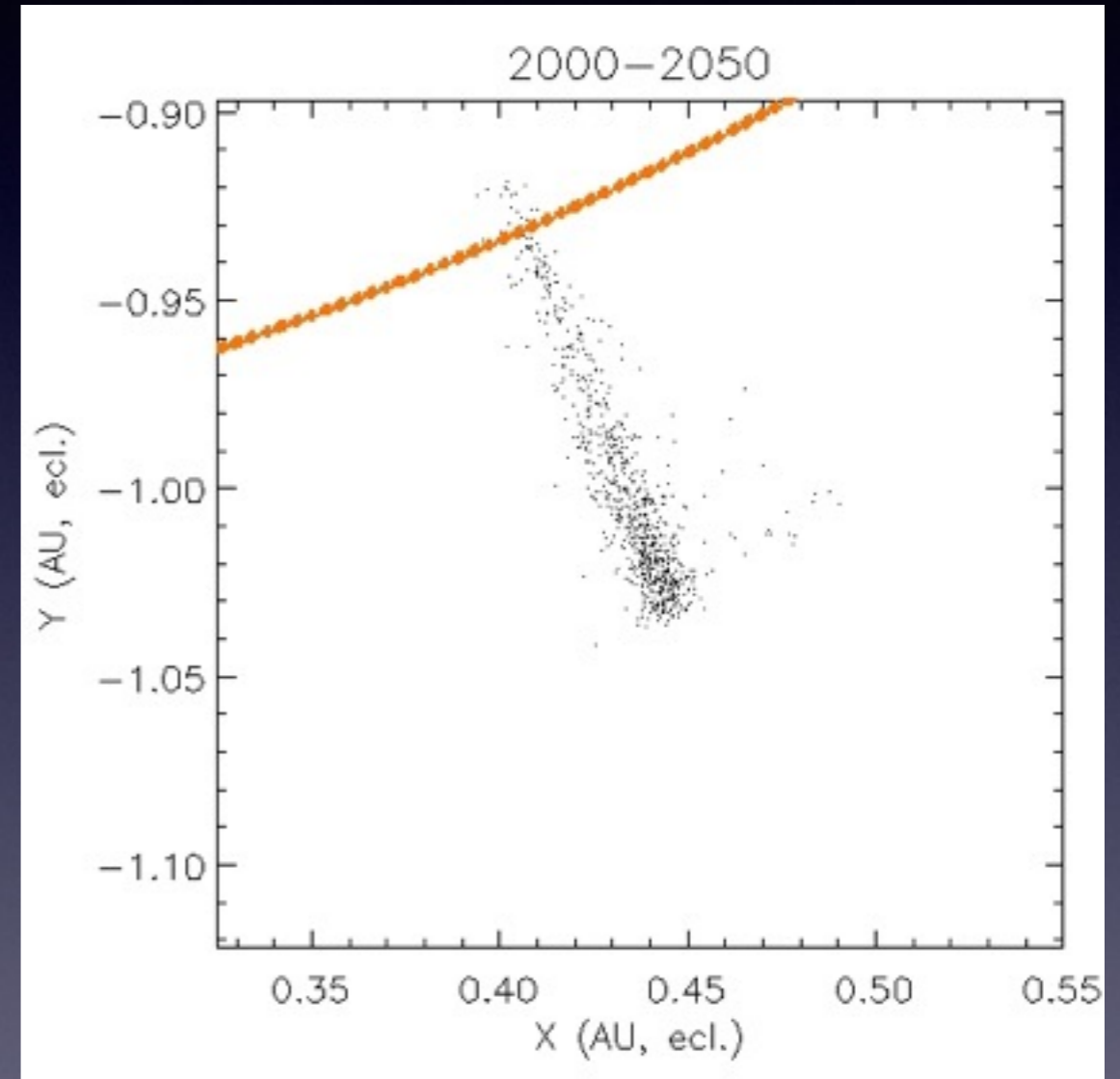


209P
1909 Trail

And all the other cases



2011 Draconids pre-1900 trails
obs by Kotten et al. 2015



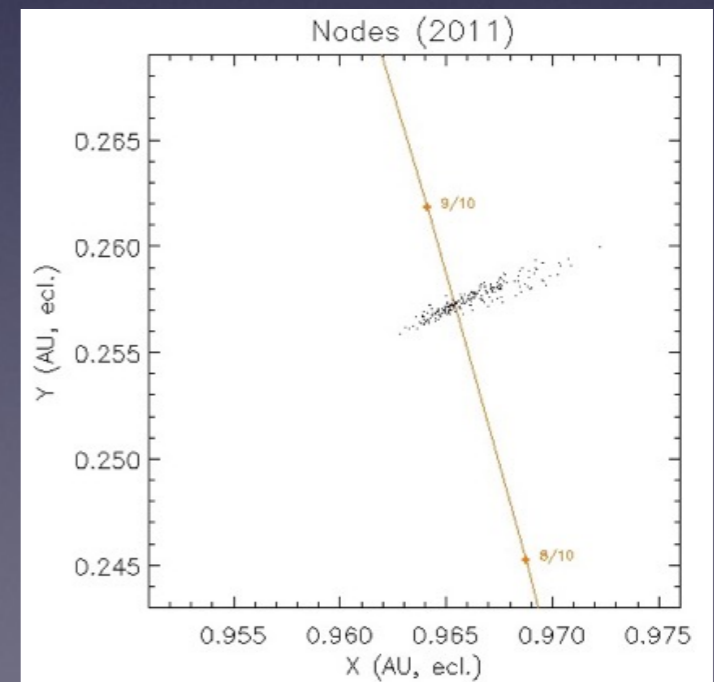
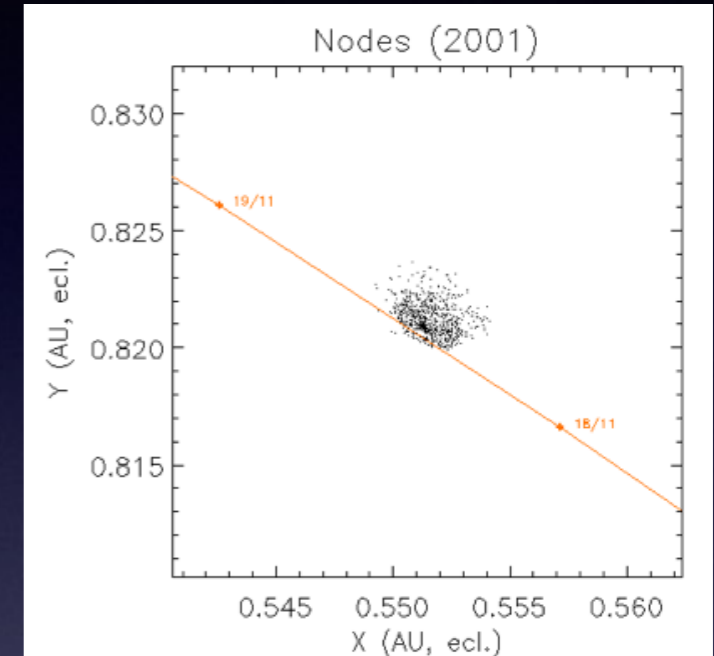
49 AND & 2001 W2
(with D. Segon)

The problem

- How confident can we be regarding the prediction of meteor showers?
- What can we do about it?
- Is there a way to quantify our confidence / ignorance?

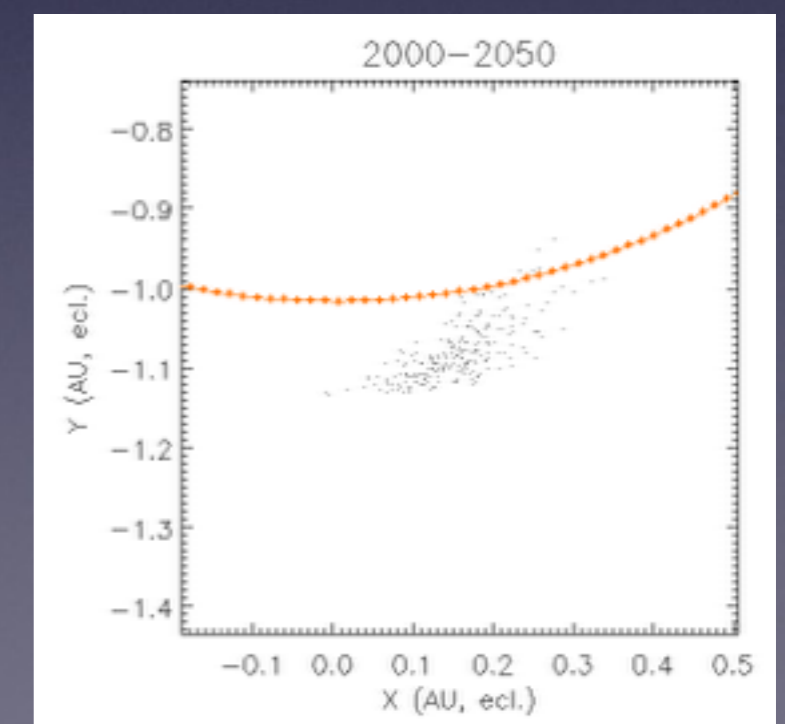
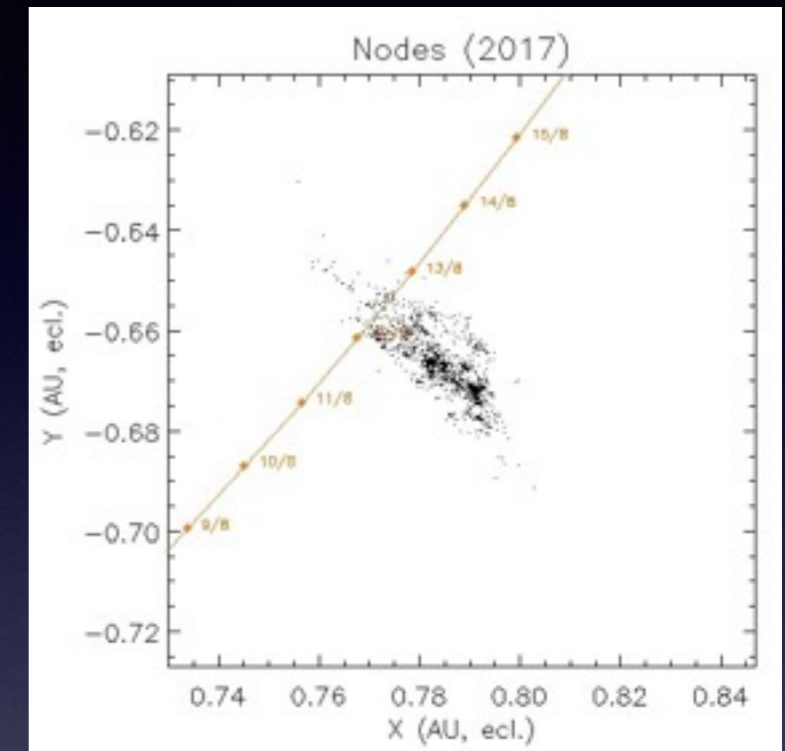
Towards a solution (1/4)

- Q1 : is the trail causing the outburst/shower identified?
- yes: example: Leonids 2001 by 1767 **SINGLE** trail
- if no => can the simulation provide you with some **GLOBAL** activity info?
- example: 2011 Draconids 1st peak by pre-1900 trails



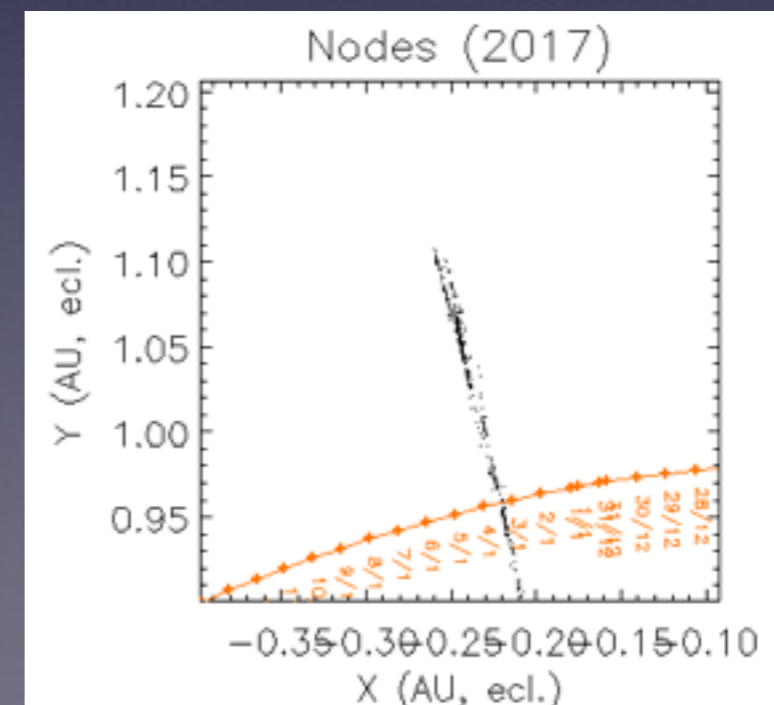
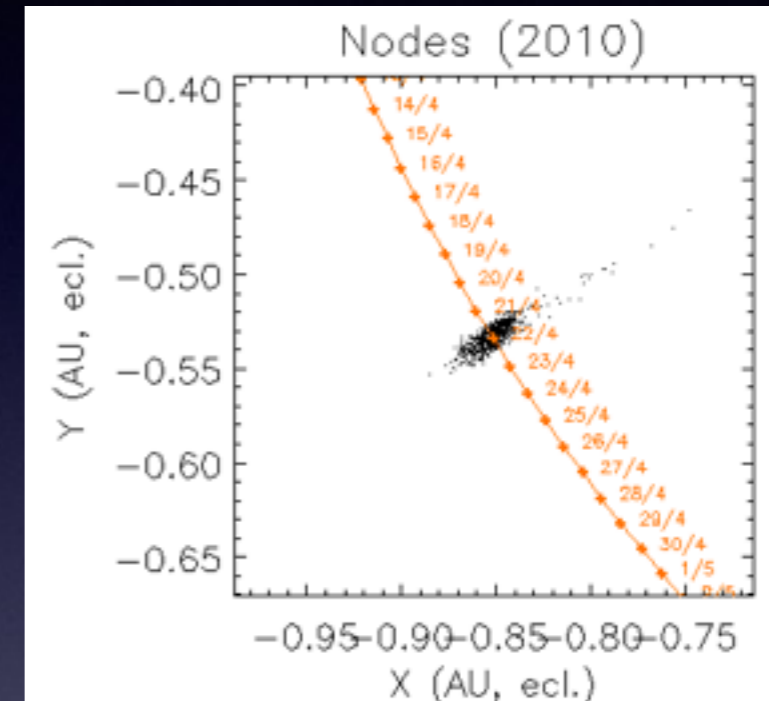
Towards a solution (2/4)

- Q2 : was the prediction using only the data of one specific year?
- example: Perseids in **YEAR** 2017
- if no => can the simulation provide you with some shower **BACKGROUND** activity info?
- example: C/1964 N1 Ikeya and July xi Arietids (see Segon's talk)



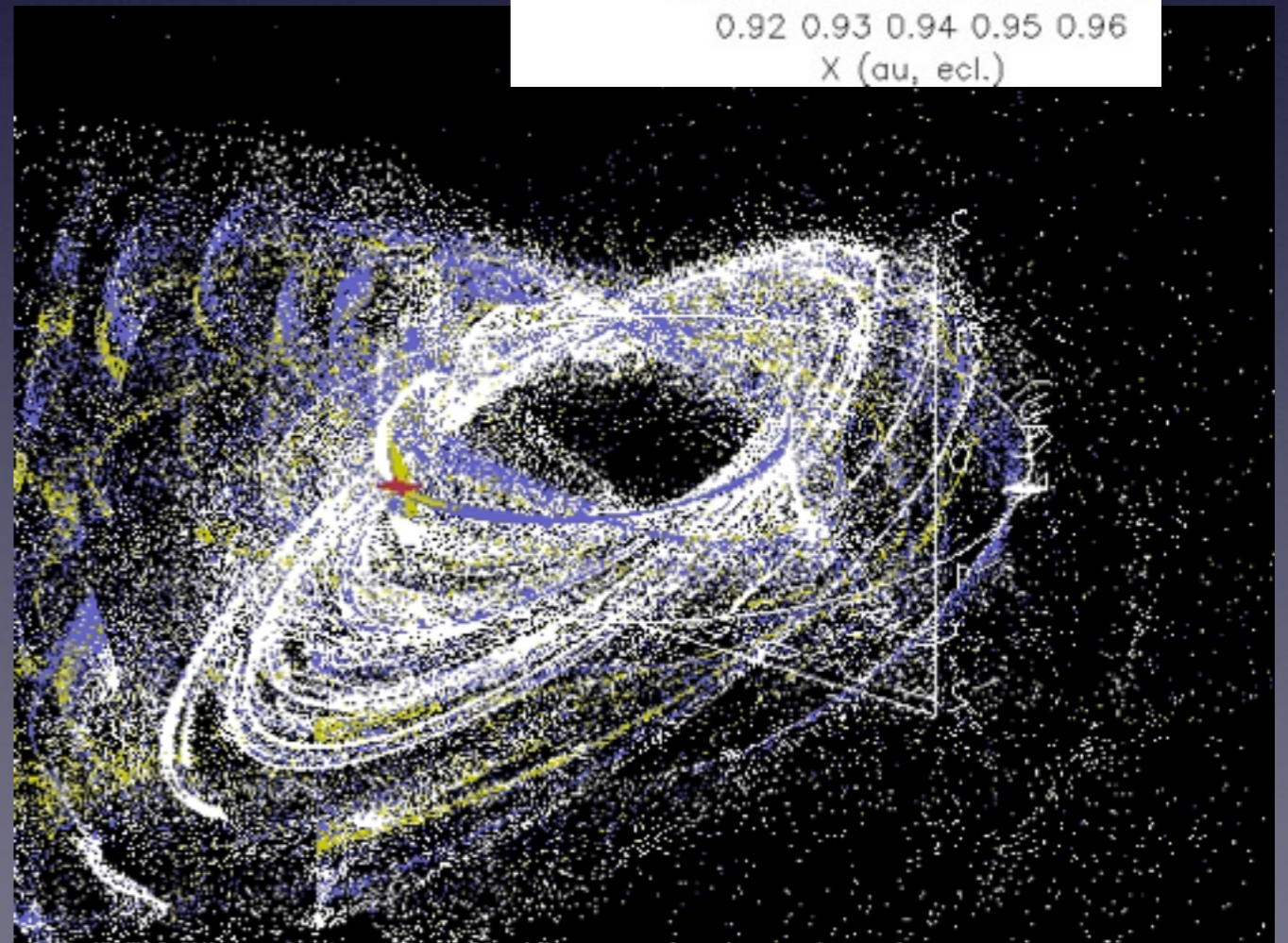
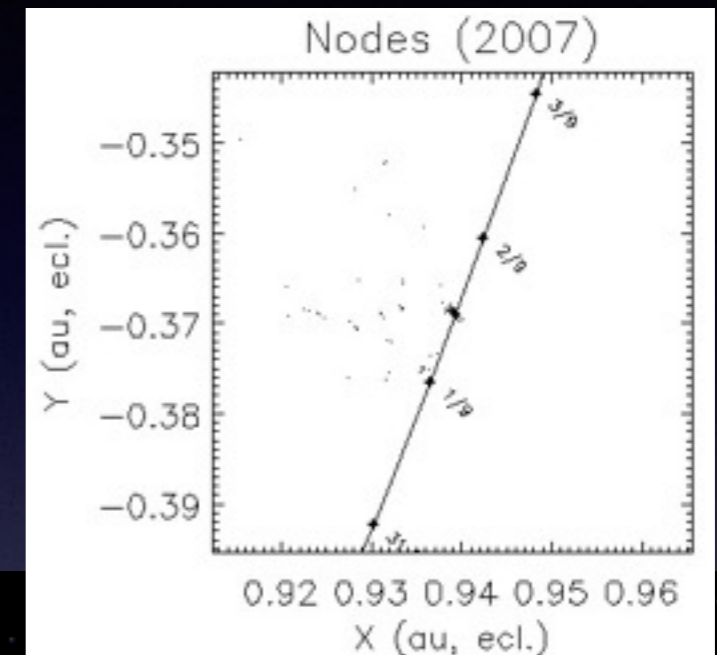
Towards a solution (3/4)

- Was the parent body **O**bserved?
- if **yes**, how often? example: C/1861 G1 Thatcher and LYR: 1/1
- **no**: example: 2003EH1 and QUA: 0/98 ; very weak activity: 209P



Towards a solution (4/4)

- Did the parent body experience close encounters with giant planets?
- **no**: ex: C/1911 N1 & AUR (in 2007)
- **yes** => how to quantify the influence?
- $\Sigma_{\text{trail}} \propto 1/r \cdot V$



Building a confidence index

1st field: # Trails	2nd field: # years	3rd field: # Observed trails	4th field: C lose E ncounter @ shower date
1 => ' S 'ingle	1 => ' Y 'ear specific	n_obs / n_total	$\sum_{\text{trail}} 1/r.V$
2+ => ' G 'lobal	2+ => ' B 'ack- ground		CU mulative: $\sum_{\text{year}} \sum_{\text{trail}} 1/r.V$

examples:

LEO in 2001: **S**Y**O**0/**1****C**E**0.00**

PER in 2017: **G**Y**O**3/**17****C**U**0.00**

209P in 2014: **G**Y**O**3/**75****C**U**46**

QUA in 2017: **G**Y**O**1/**57****C**U**1500**

Conclusion

- confidence index: NOT a unique number
- provides an idea of how the prediction was performed and how much we can trust it
- not perfect but better than nothing