



# GNSS Knowledge Map

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Seminario Taller Regional GNSS 2008  
Medellín-Colombia



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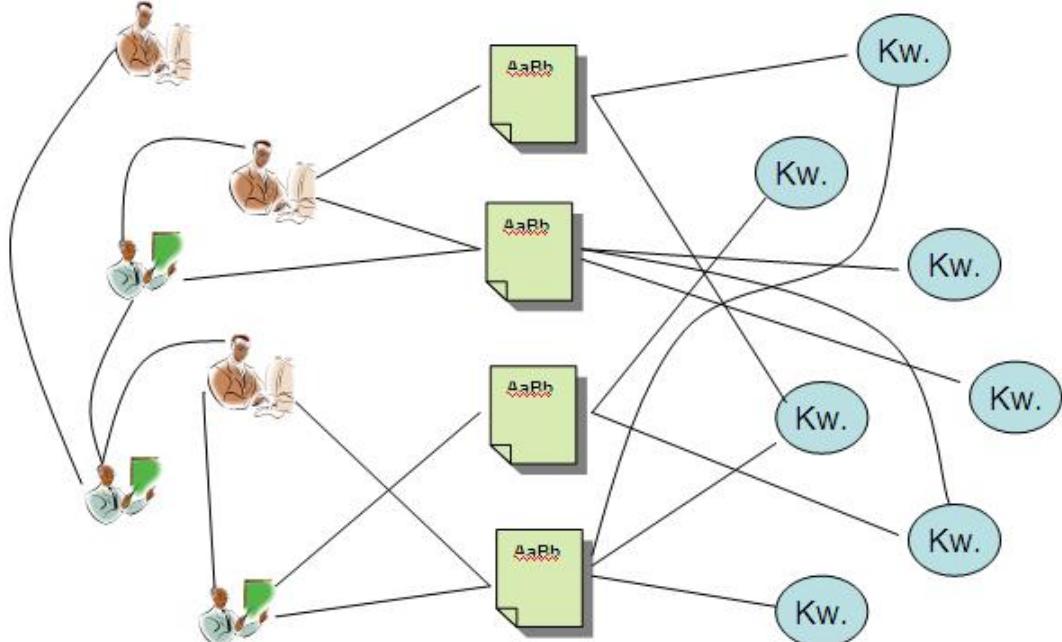
# Scientometrics<sup>1</sup>

- Theoretical Reconstruction: The idea is to use mathematical and computational models that help in the construction of the phenomenological structures.
- What is a knowledge map?
  - Co-word analysis (keywords)
  - Relations among concepts
- Emergence of Research Areas
- Scientometrics as a policy making tool

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<sup>1</sup>Chavalarias D. & Cointet J-P. (2008) Scientometrics Vol. 75 No. 1

# Makers of scientific activity



Authors → Medium → Knowledge

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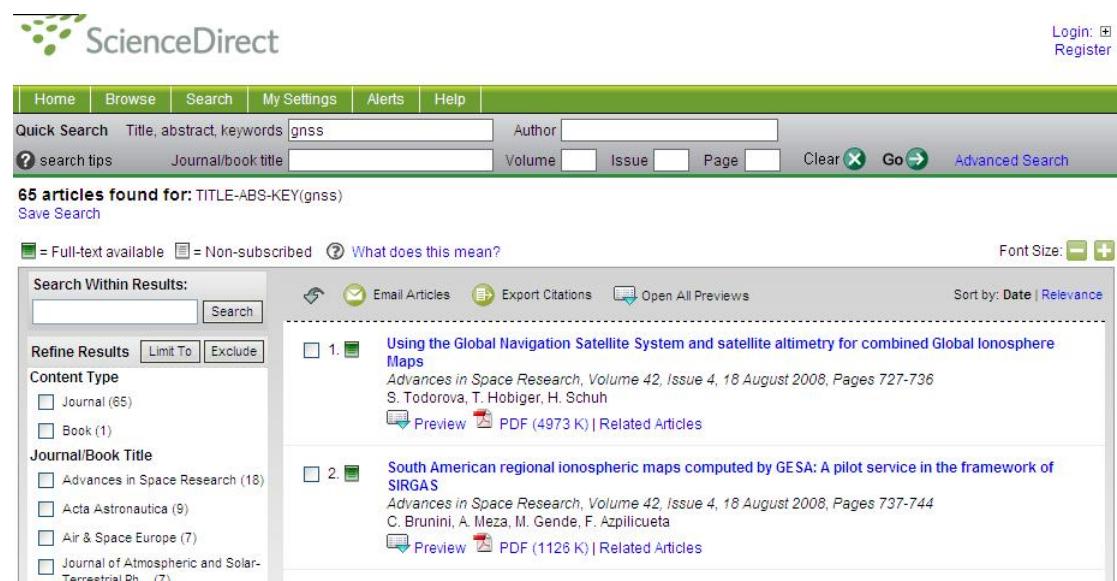
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# Building the data-base

- RIS Format: The RIS file format is a tagged format for expressing bibliographic citations. It is supported by a number of reference managers.



The screenshot shows the ScienceDirect search interface. At the top, there's a navigation bar with links for Home, Browse, Search, My Settings, Alerts, and Help. Below that is a search bar with fields for Quick Search (Title, abstract, keywords), Author, and Journal/book title, along with dropdowns for Volume, Issue, and Page, and buttons for Clear, Go, and Advanced Search. The main content area displays a list of search results:

**65 articles found for: TITLE-ABS-KEY(gnss)**

Save Search

Legend: = Full-text available = Non-subscribed = What does this mean?

Font Size:

Sort by: Date | Relevance

**Search Within Results:**

**Refine Results:**

**Content Type:**  Journal (65)  Book (1)

**Journal/Book Title:**  Advances in Space Research (18)  Acta Astronautica (9)  Air & Space Europe (7)  Journal of Atmospheric and Solar-Terrestrial Physics (7)

**1.**  Using the Global Navigation Satellite System and satellite altimetry for combined Global Ionosphere Maps  
*Advances in Space Research, Volume 42, Issue 4, 18 August 2008, Pages 727-736*  
S. Todorova, T. Hobiger, H. Schuh  
 PDF (4973 K) | Related Articles

**2.**  South American regional ionospheric maps computed by GESE: A pilot service in the framework of SIRGAS  
*Advances in Space Research, Volume 42, Issue 4, 18 August 2008, Pages 737-744*  
C. Brunini, A. Meza, M. Gende, F. Apilicueta  
 PDF (1126 K) | Related Articles



# GNSS and Related Areas

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## Data features

- 45.000 Authors
- 21.000 different titles
- More than 100 journals
- 600 items related to navigation satellite systems (final selection)

# GNSS and Related Areas

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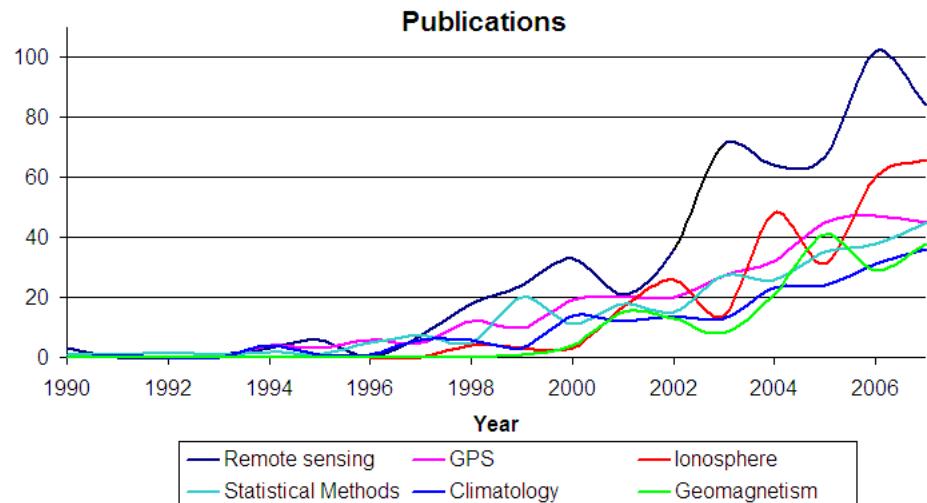
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# Proximity measure<sup>2</sup>

Let  $i$  and  $j$  be two keywords, then:

- $n_i$  = number of articles mentioning  $i$
- $n_{i,j}$  number of articles mentioning  $i$  and  $j$

The proximity measure must fulfill:

- $P(i, j) = 0$  iff  $n_{i,j} = 0$
- $\lim_{\frac{n_{i,j}}{n_i} \rightarrow 0} P(i, j) = 0$ , general topics
- $P(i, j) = 1$
- $D_{n_{i,j}} P(i, j) > 0$  and  $D_{n_i} P(i, j) < 0$

Then,

$$P(i, j) = \frac{n_{i,j}^2}{n_i n_j} \quad (1)$$

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<sup>2</sup>Chavalarias D. & Cointet J-P. (2008) Scientometrics Vol. 75 No. 1

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# Clustering - K-clique percolation<sup>3</sup>

**CURRENT VERSION:**  
**CFinder 1.21**  
Jan 31, 2006  
Requires Java (JRE) >>

**TESTING VERSION:**  
**CFinder 2.0b4**  
Nov 23, 2007  
Requires Java (JRE) >>

**Clusters & Communities**  
*overlapping dense groups in networks*

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**Feedback**  
**NEW** [CFinder](#) has been recently applied to quantifying the evolution of social groups:  
Palla et. al. [nature 446](#), 664 (2007).

**Screenshots**

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**CFinder** is a free software for finding overlapping dense groups of nodes in networks, based on the Clique Percolation Method (CPM) of Palla et. al. [nature 435](#), 815 (2005).

**CFinder** offers a fast and efficient method for clustering data represented by large graphs, such as genetic or social networks and microarray data. CFinder is also very efficient for locating the cliques of large sparse graphs.

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A cluster -- also called a community or module -- in a network is a group of nodes more densely connected to each other than to nodes outside the group. In real networks clusters often overlap. Examples for overlapping clusters obtained by CFinder in a protein-protein interaction network and a word association graph are reproduced here from Palla et. al. (2005). Click on the images to view them enlarged in a separate window.

<sup>3</sup>Palla, G., Derenyi, I., Farkas, I., Vicsek, T. (2005), Uncovering the overlapping community structure of complex networks in nature and society, *Nature*, 435:814.

# Clusters

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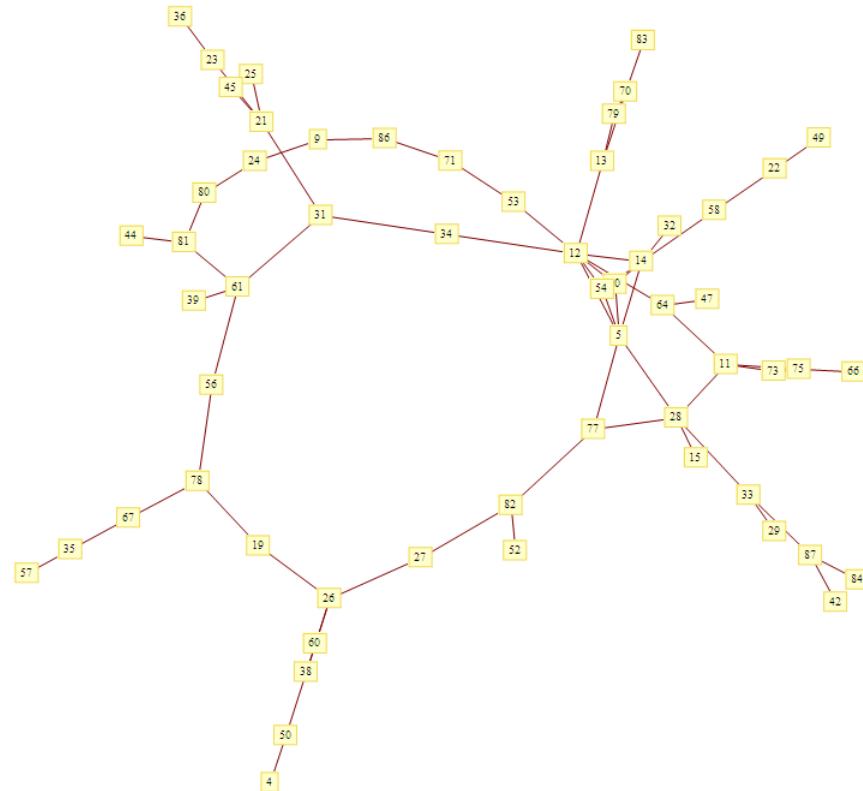
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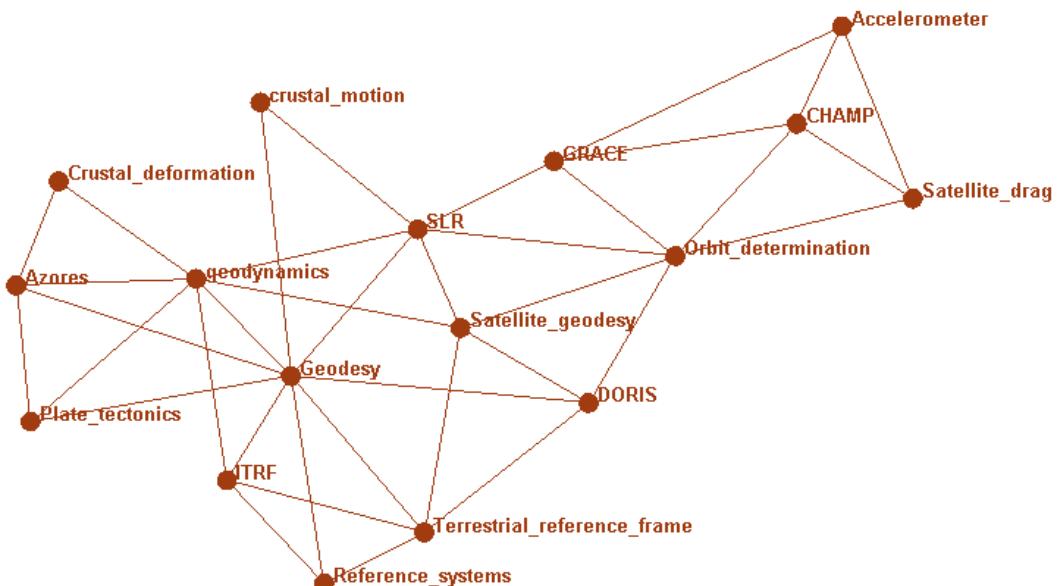
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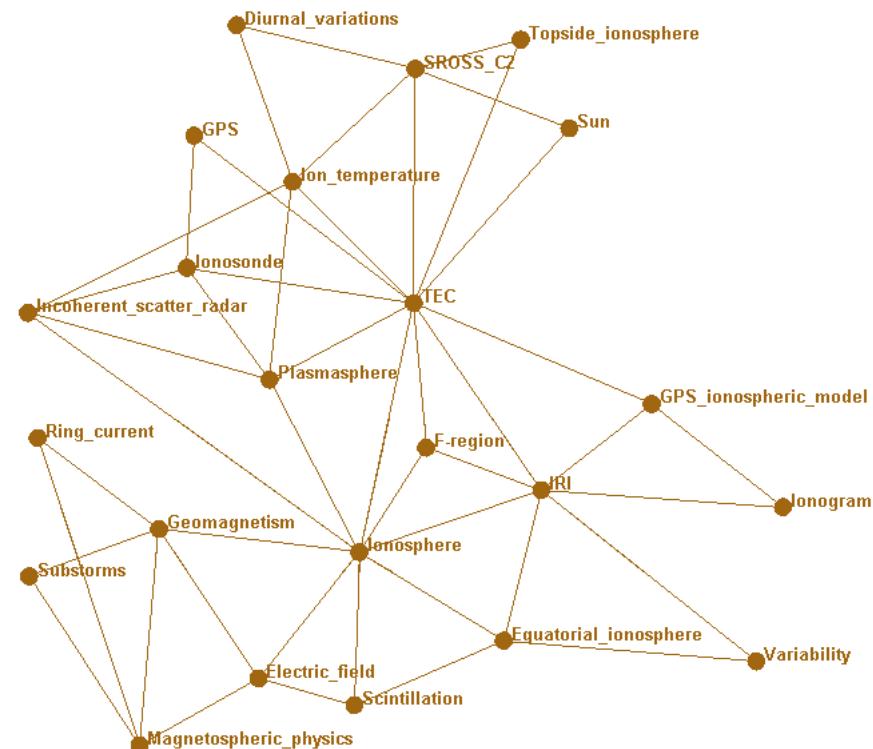
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# C14 - Aeronomy

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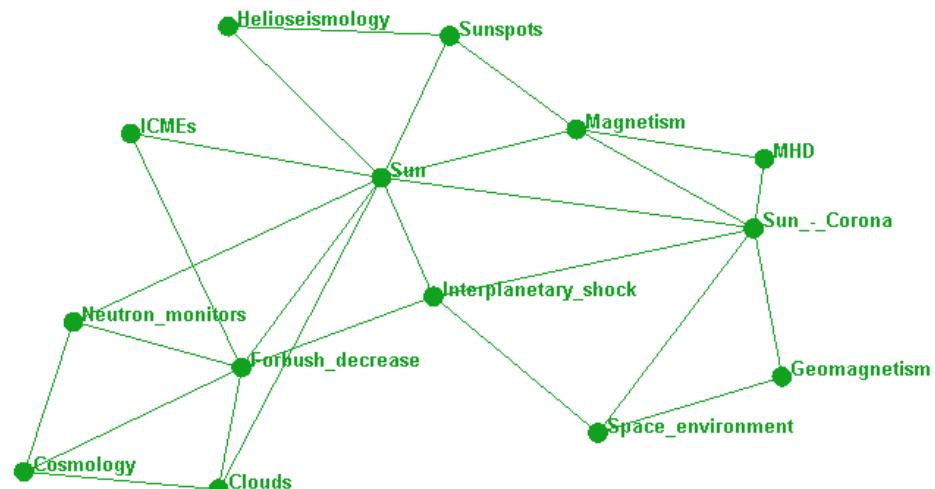
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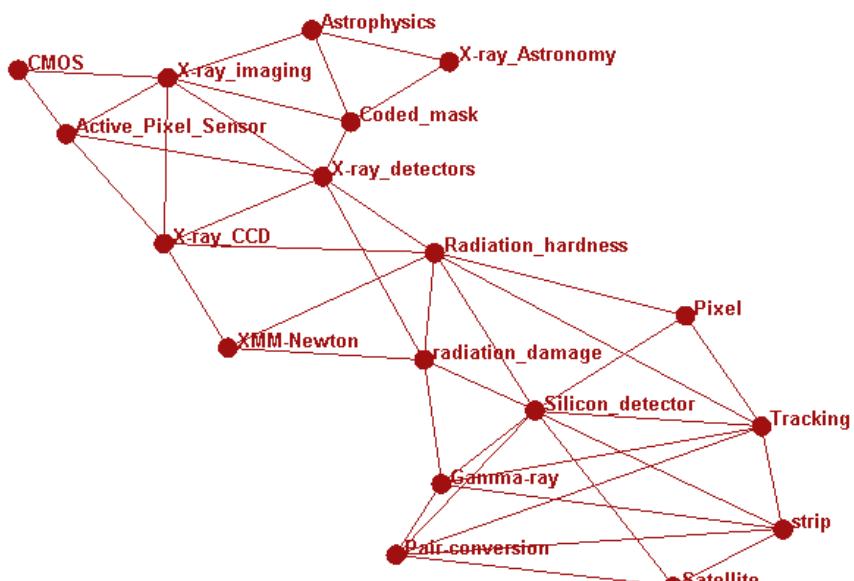
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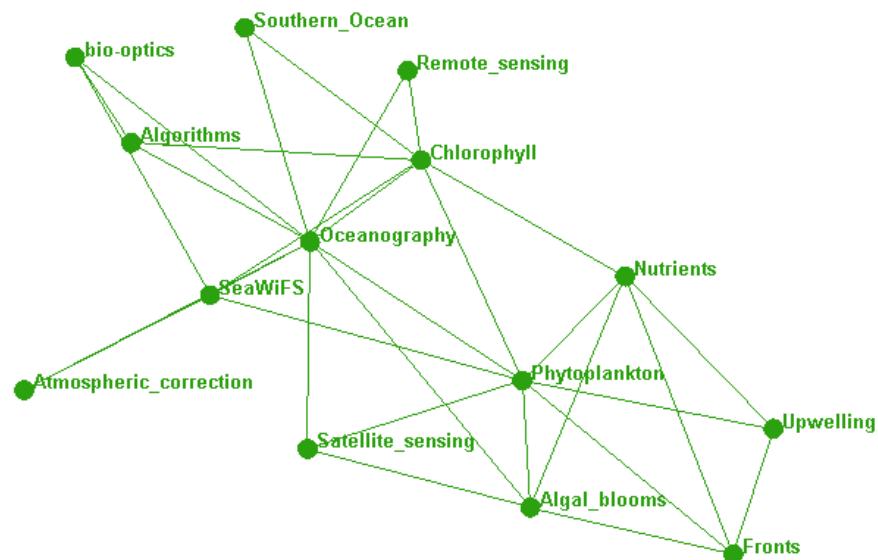
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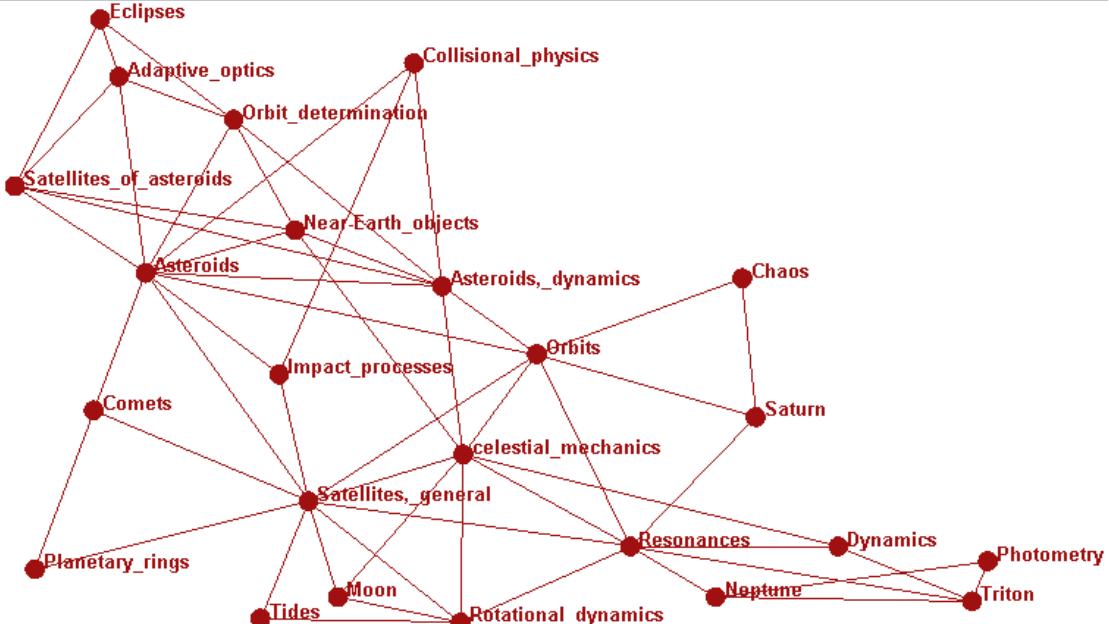
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# C33 - Astronomy

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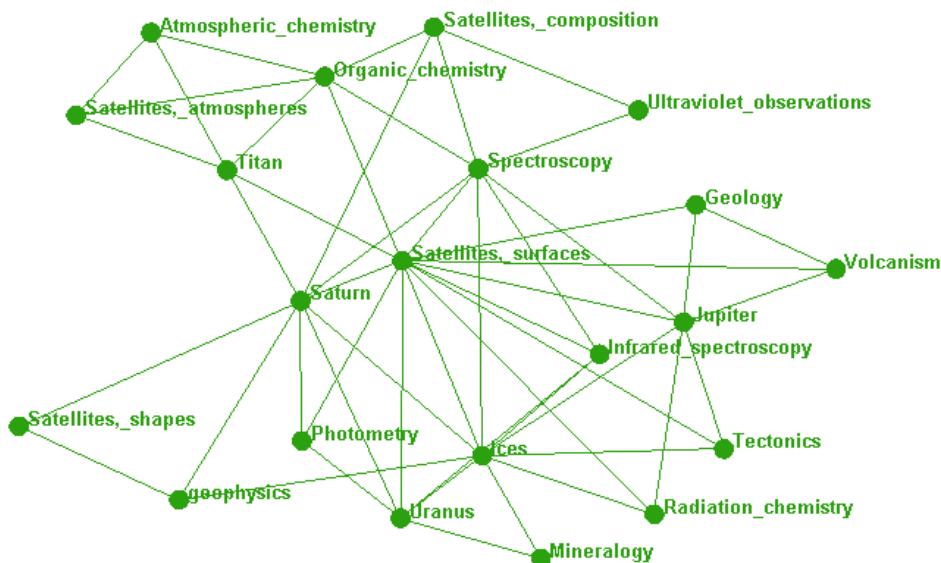
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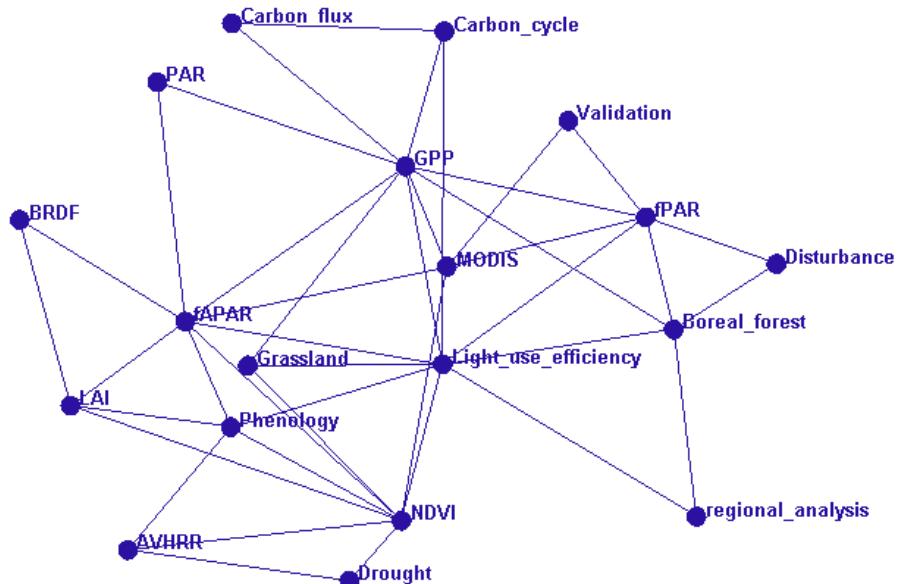
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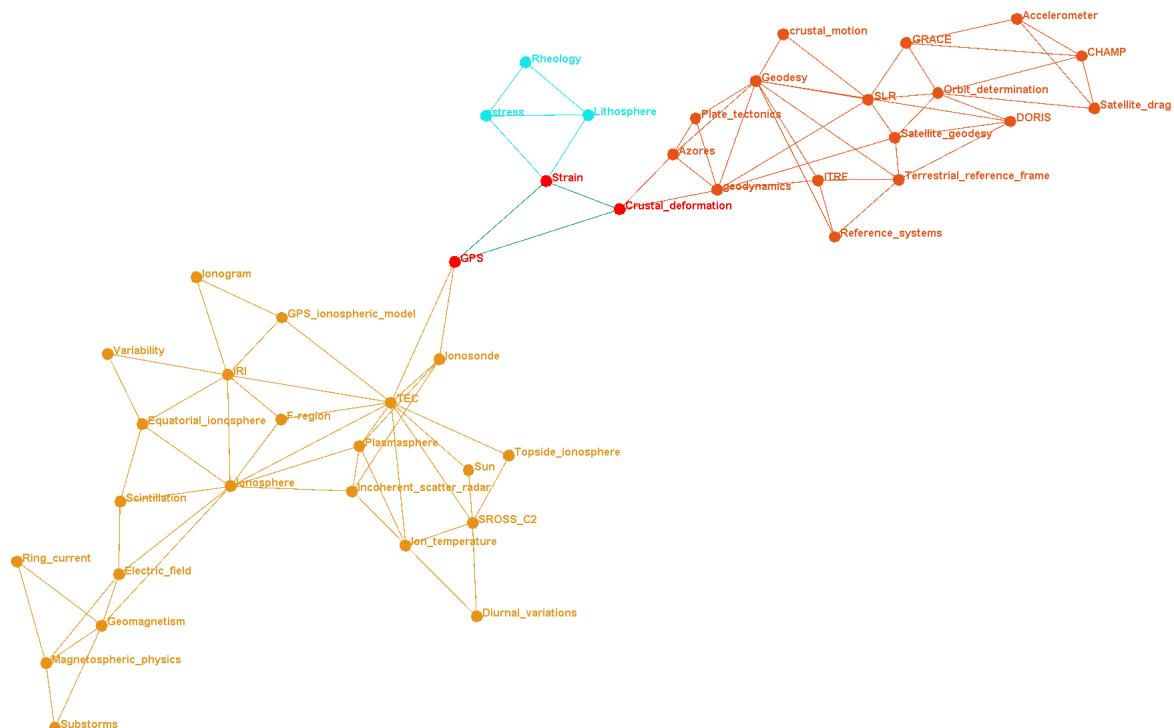
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# Conclusion

- It is possible reconstruct how scientific fields are articulated around gnss applications

# Perspectives

- Early detection of emergent scientific fields
- Prediction of terms dynamics
- Localization of scientific themes to make a development policy



## References

- [1] Chavalarias D. & Cointet J-P. (2008) Scientometrics Vol. 75 No. 1
- [2] Palla, G., Derenyi, I., Farkas, I., Vicsek, T. (2005), Uncovering the overlapping community structure of complex networks in nature and society, Nature, 435:814.

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