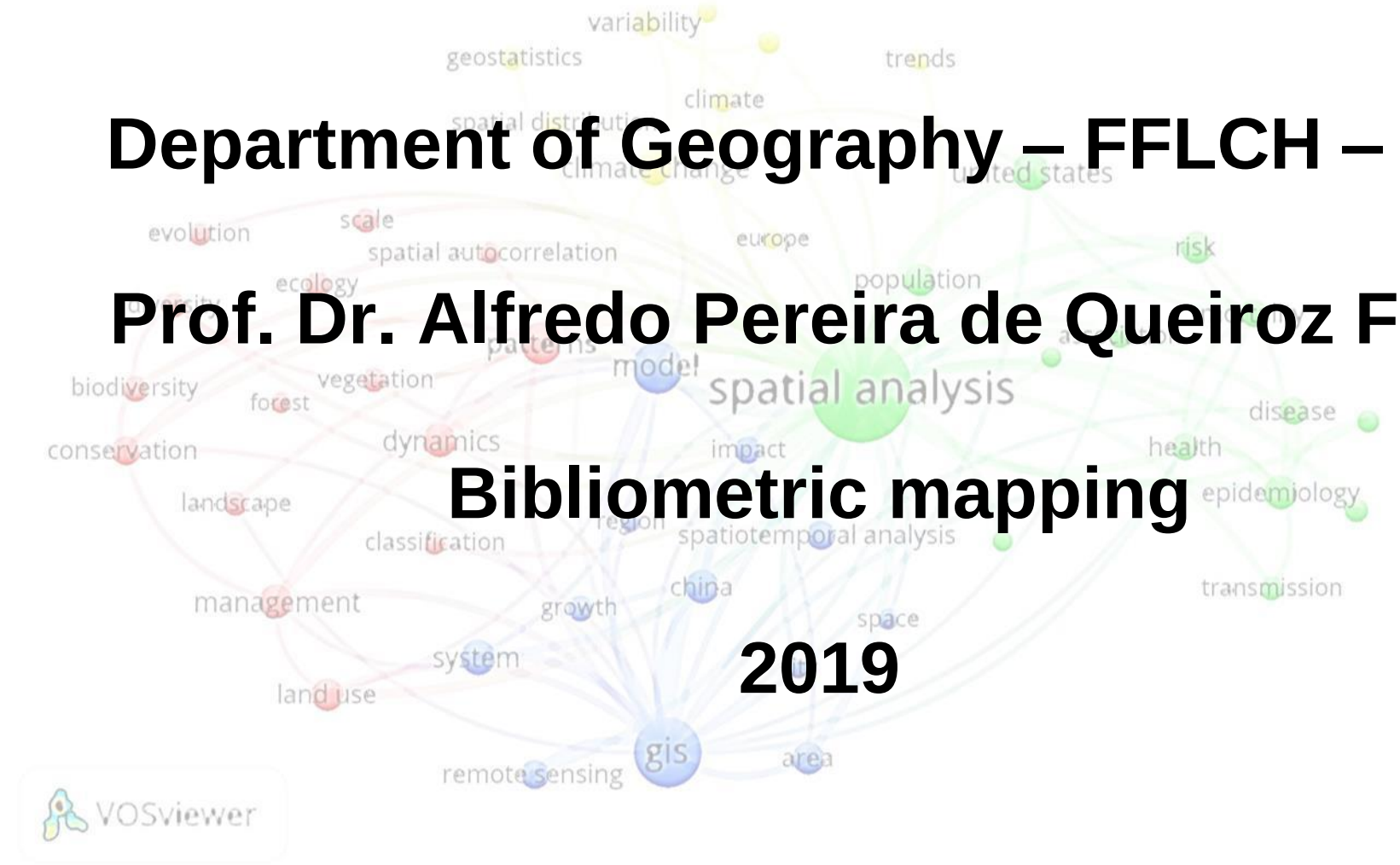
Department of Geography – FFLCH – USP

Prof. Dr. Alfredo Pereira de Queiroz Filho

Bibliometric mapping

2019

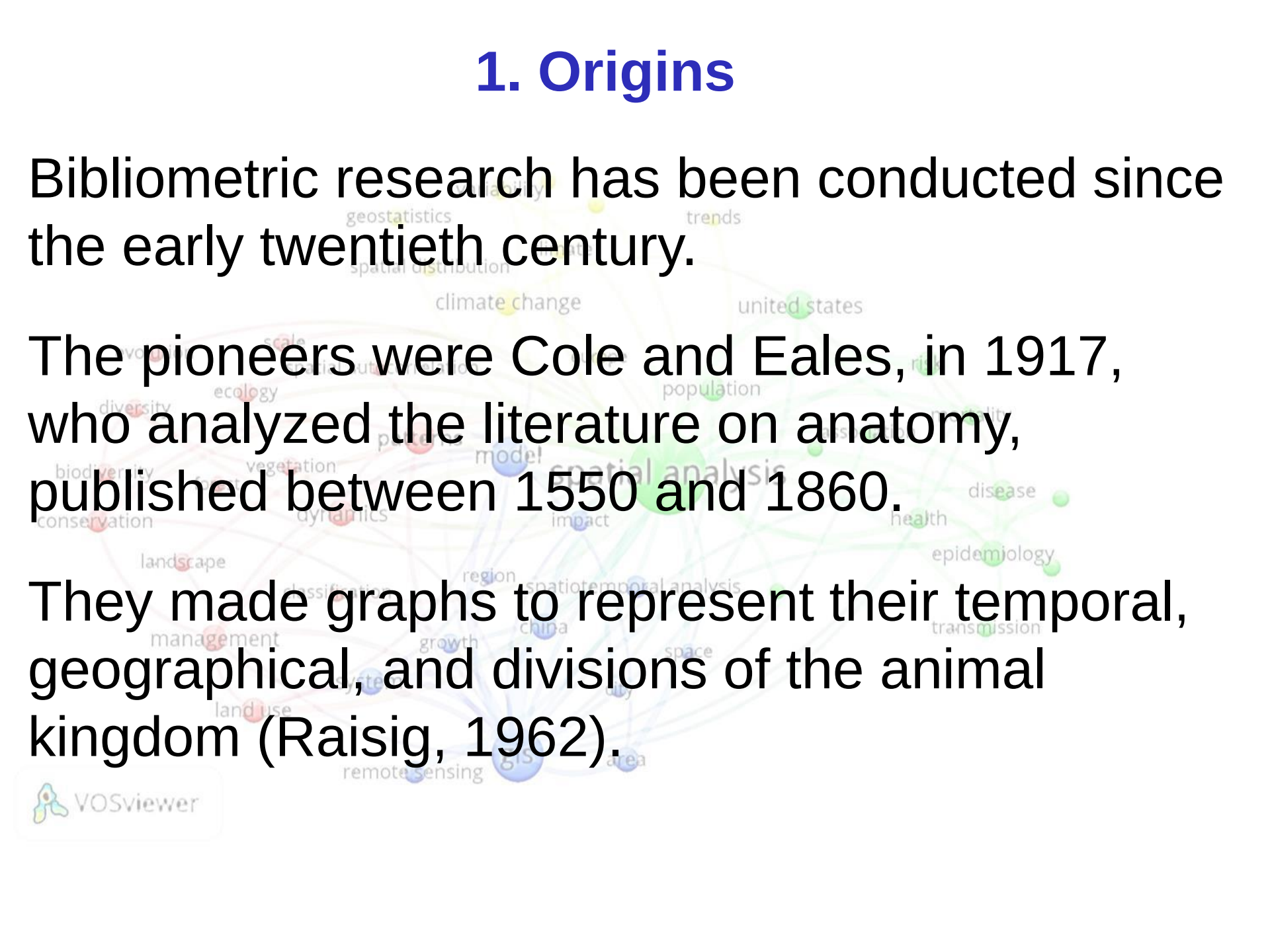


1. Origins

Bibliometric research has been conducted since the early twentieth century.

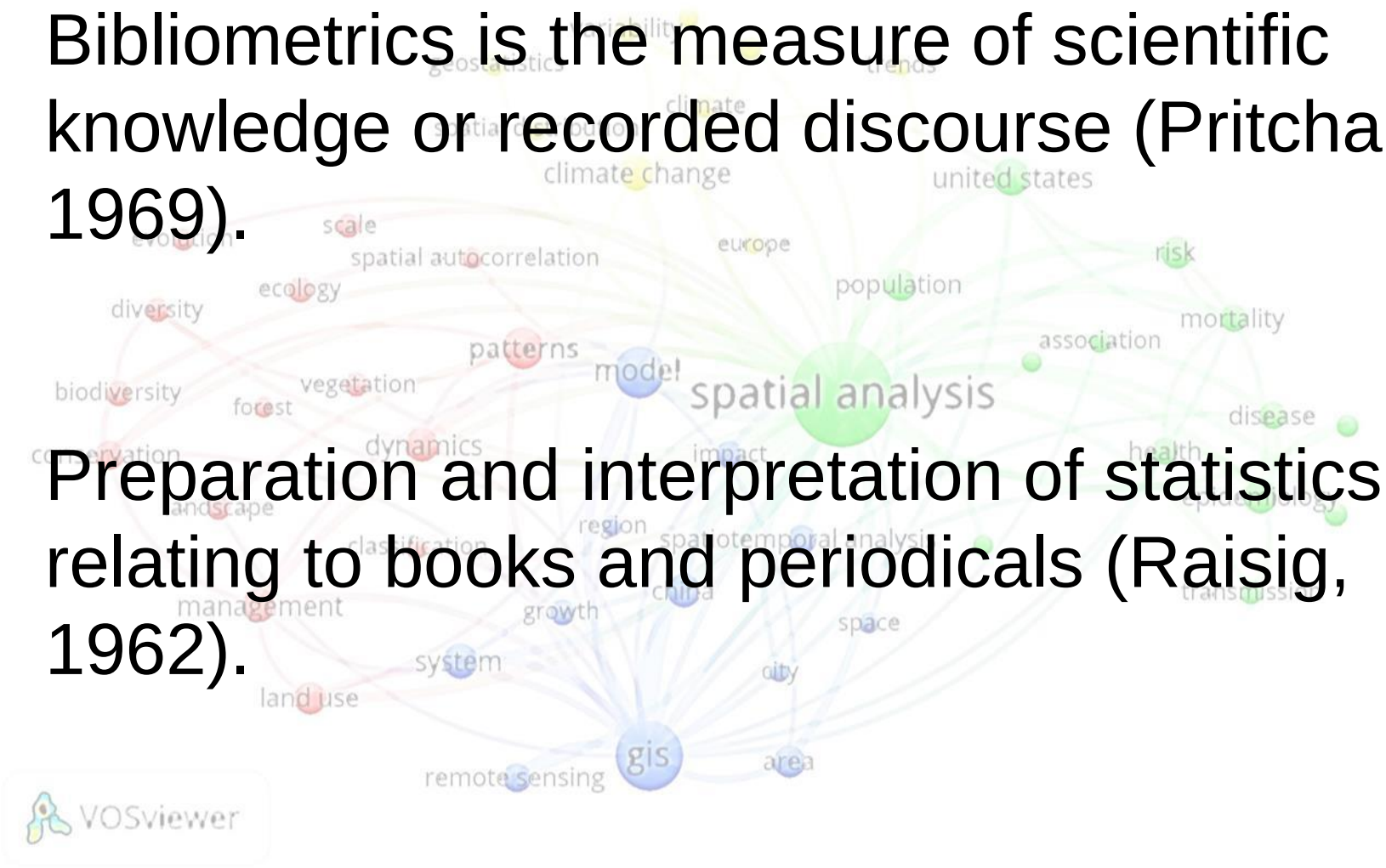
The pioneers were Cole and Eales, in 1917, who analyzed the literature on anatomy, published between 1550 and 1860.

They made graphs to represent their temporal, geographical, and divisions of the animal kingdom (Raisig, 1962).



2. Bibliometrics

Bibliometrics is the measure of scientific knowledge or recorded discourse (Pritchard, 1969).

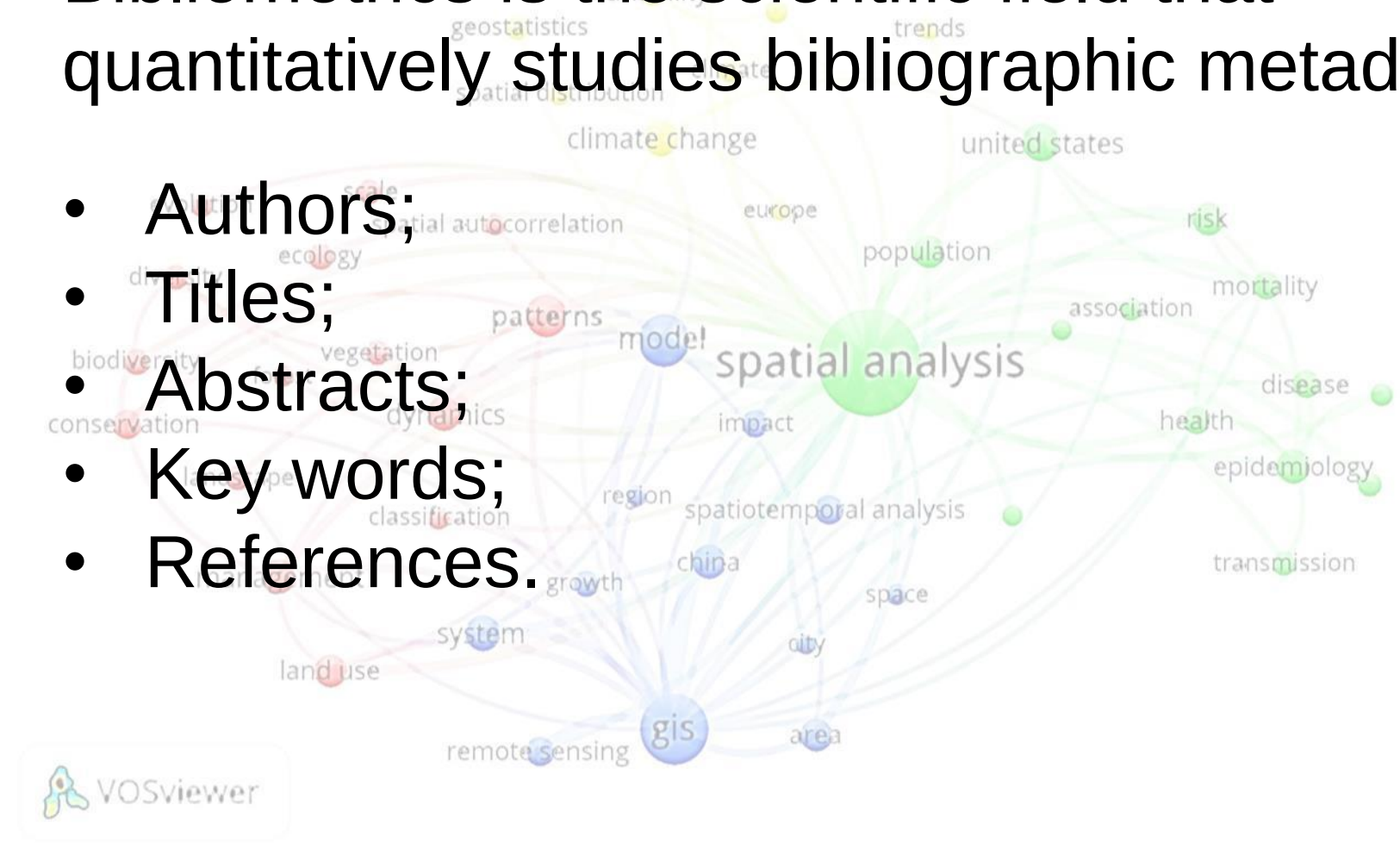


Preparation and interpretation of statistics relating to books and periodicals (Raisig, 1962).

2. Bibliometrics

Bibliometrics is the scientific field that quantitatively studies bibliographic metadata:

- Authors;
- Titles;
- Abstracts;
- Key words;
- References.

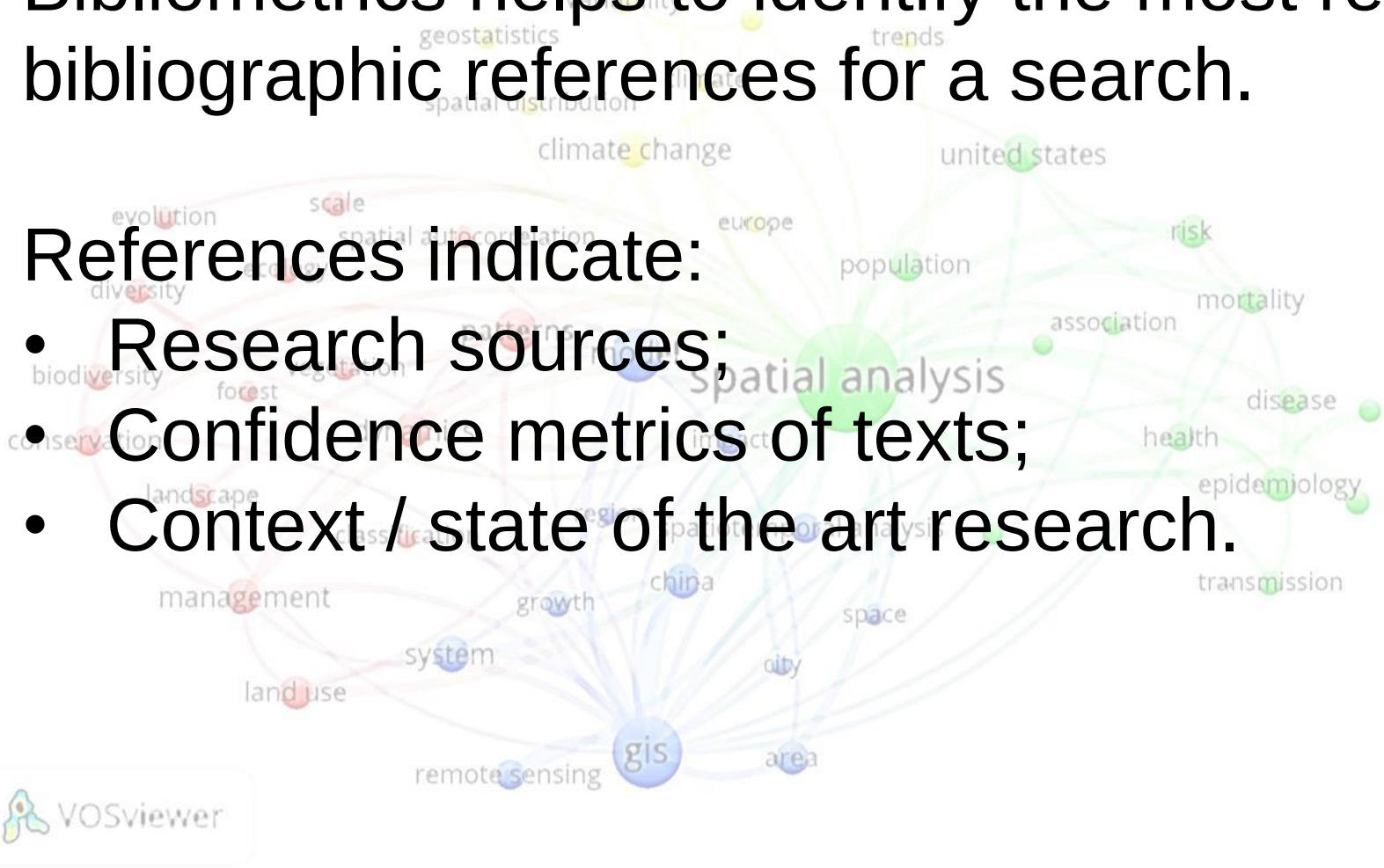


3. Relevance

Bibliometrics helps to identify the most relevant bibliographic references for a search.

References indicate:

- Research sources;
- Confidence metrics of texts;
- Context / state of the art research.



3. Relevance

The literature review is fundamental for:

- Research project;
- Qualification;
- Dissertation / Thesis;
- Publication of articles (communication).

A good review can serve all of these steps, even if supplemented.

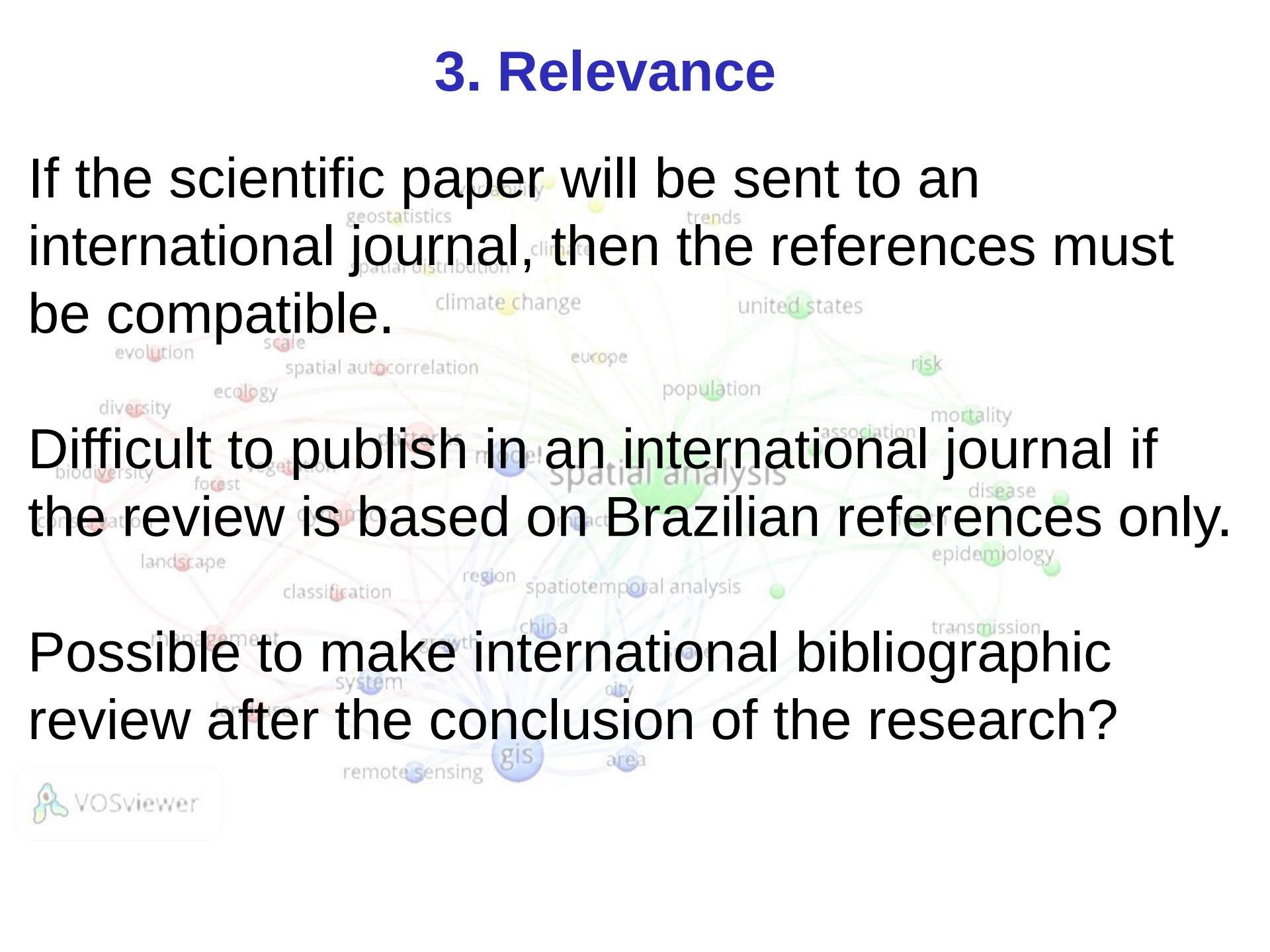
And it helps (re) direct the search.

3. Relevance

If the scientific paper will be sent to an international journal, then the references must be compatible.

Difficult to publish in an international journal if the review is based on Brazilian references only.

Possible to make international bibliographic review after the conclusion of the research?



4. Laws and Principles

The main laws are:

- Lotka's Law of 1926 (authors);
- Bradford Law of 1934 (journals);
- Zipf's Law of 1949 (words).

They are related to the most important academic questions.

4. Laws and Principles

Lotka found that the authors' productivity followed a mathematical relationship.

He analyzed the scientific publications of physicists and chemists in the journal Chemical Abstracts, between 1907 and 1916 (Egghe, 1985).

The more productive an author is, the greater the tendency to publish again. And the less productive, the less chance of new publications.

4. Laws and Principles

Bradford compiled geophysical articles between 1931 and 1933 and discovered a mathematical regularity between publications (Andres, 2009).

Inverse relationship between the number of articles published in an area and the number of journals in which they appear.

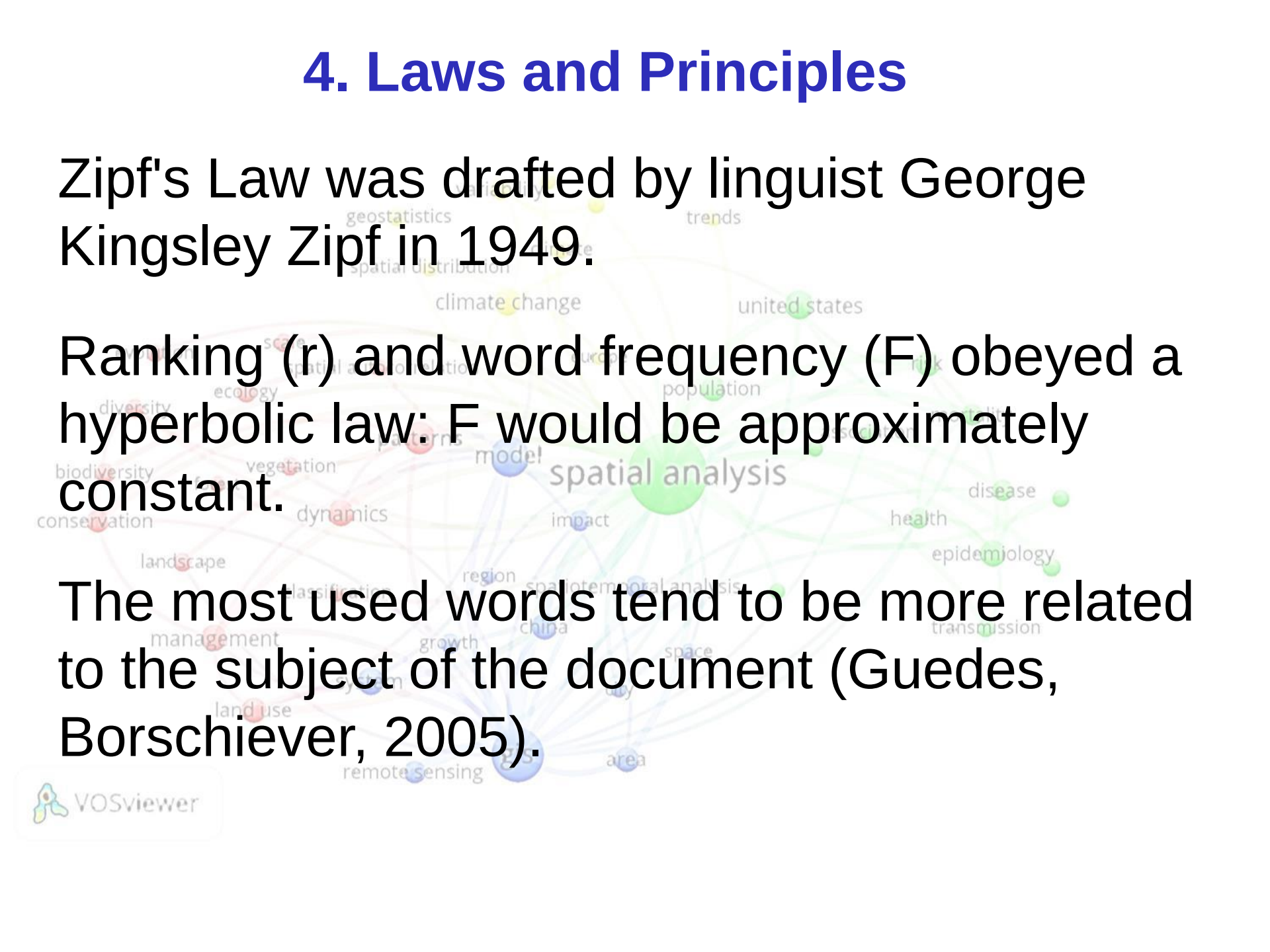
In one area of knowledge, a small number of journals account for a considerable percentage of total publications.

4. Laws and Principles

Zipf's Law was drafted by linguist George Kingsley Zipf in 1949.

Ranking (r) and word frequency (F) obeyed a hyperbolic law: F would be approximately constant.

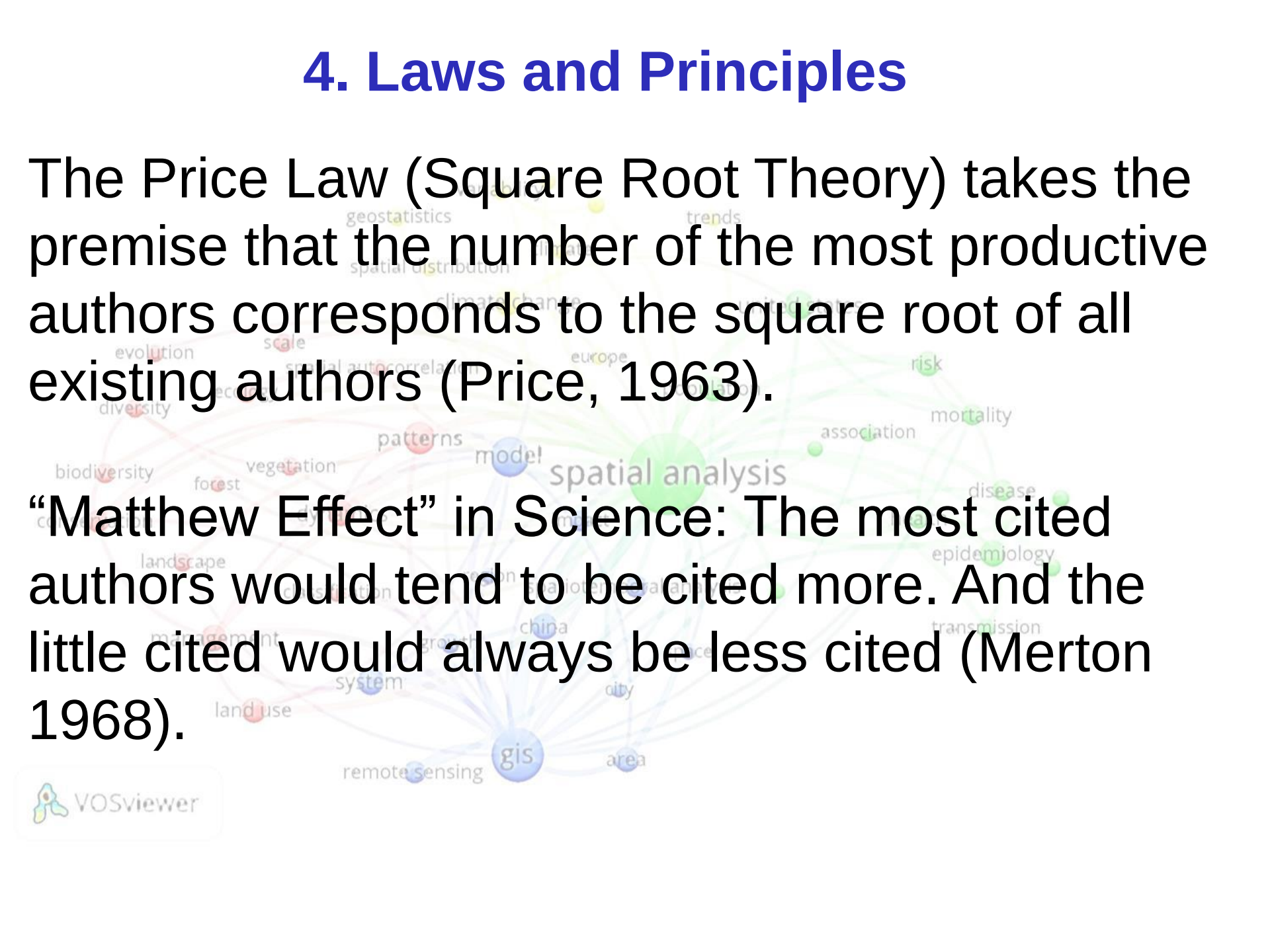
The most used words tend to be more related to the subject of the document (Guedes, Borschiever, 2005).



4. Laws and Principles

The Price Law (Square Root Theory) takes the premise that the number of the most productive authors corresponds to the square root of all existing authors (Price, 1963).

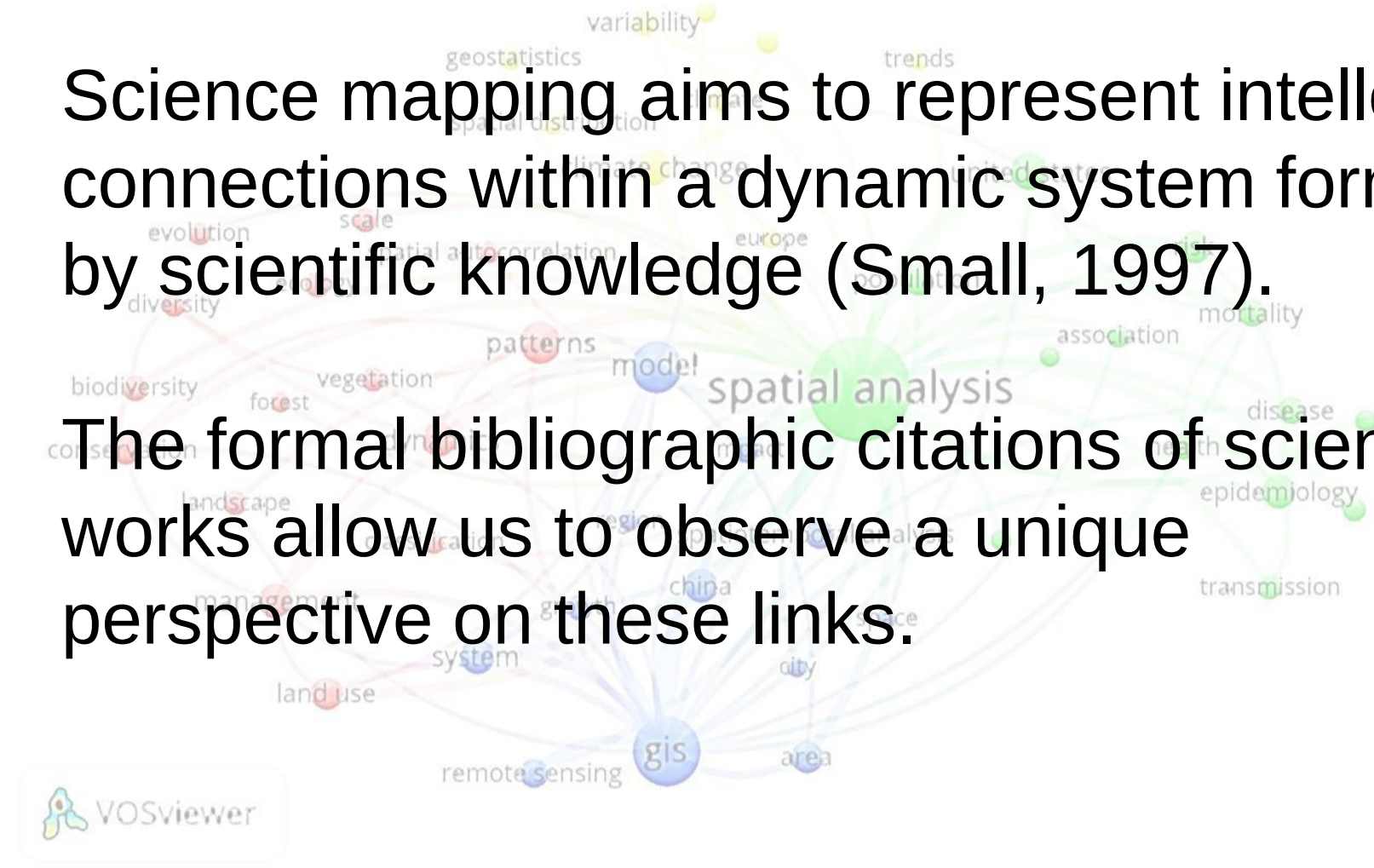
“Matthew Effect” in Science: The most cited authors would tend to be cited more. And the little cited would always be less cited (Merton 1968).



5. Bibliometric map

Science mapping aims to represent intellectual connections within a dynamic system formed by scientific knowledge (Small, 1997).

The formal bibliographic citations of scientific works allow us to observe a unique perspective on these links.

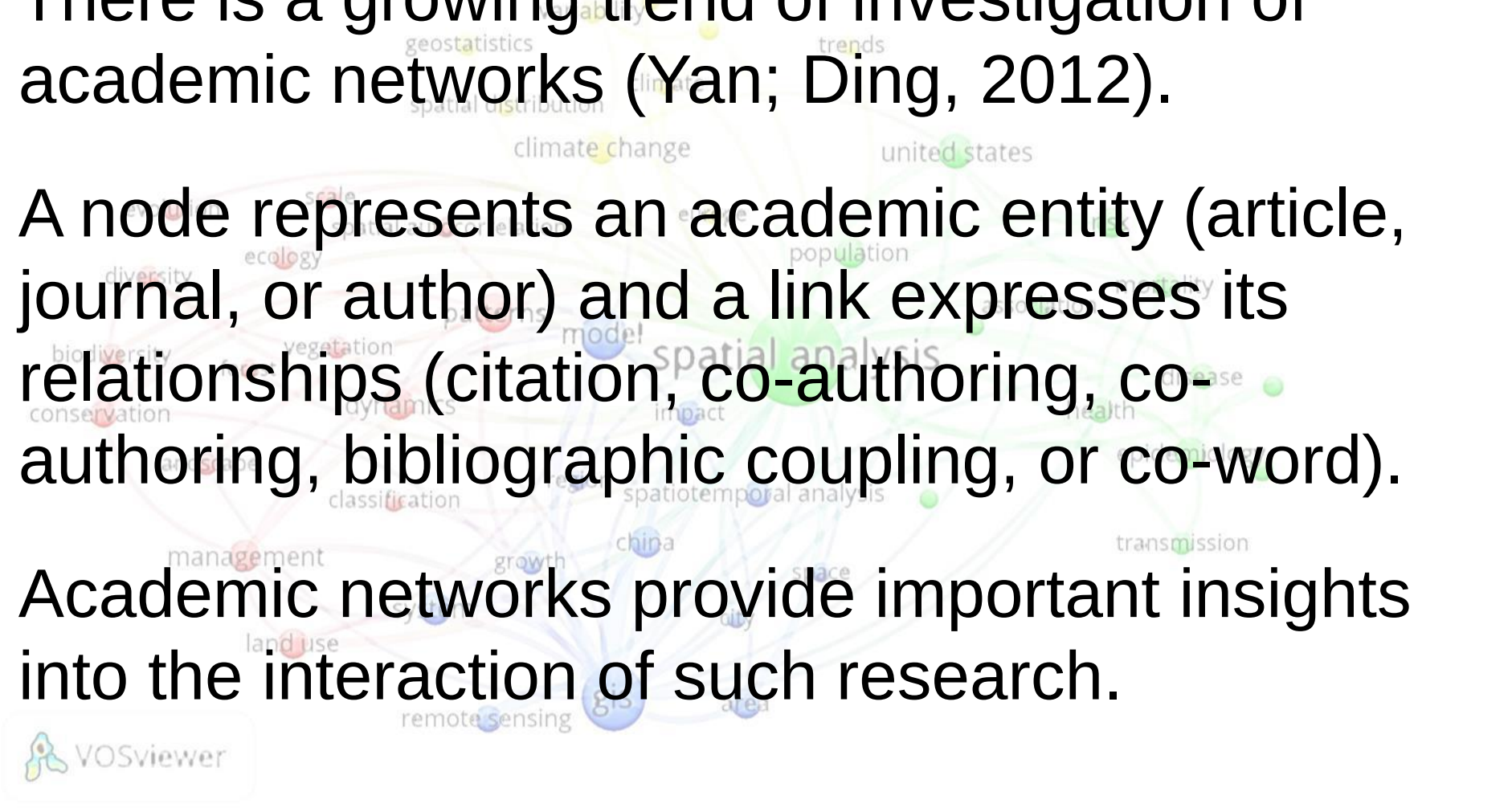


5. Bibliometric map

There is a growing trend of investigation of academic networks (Yan; Ding, 2012).

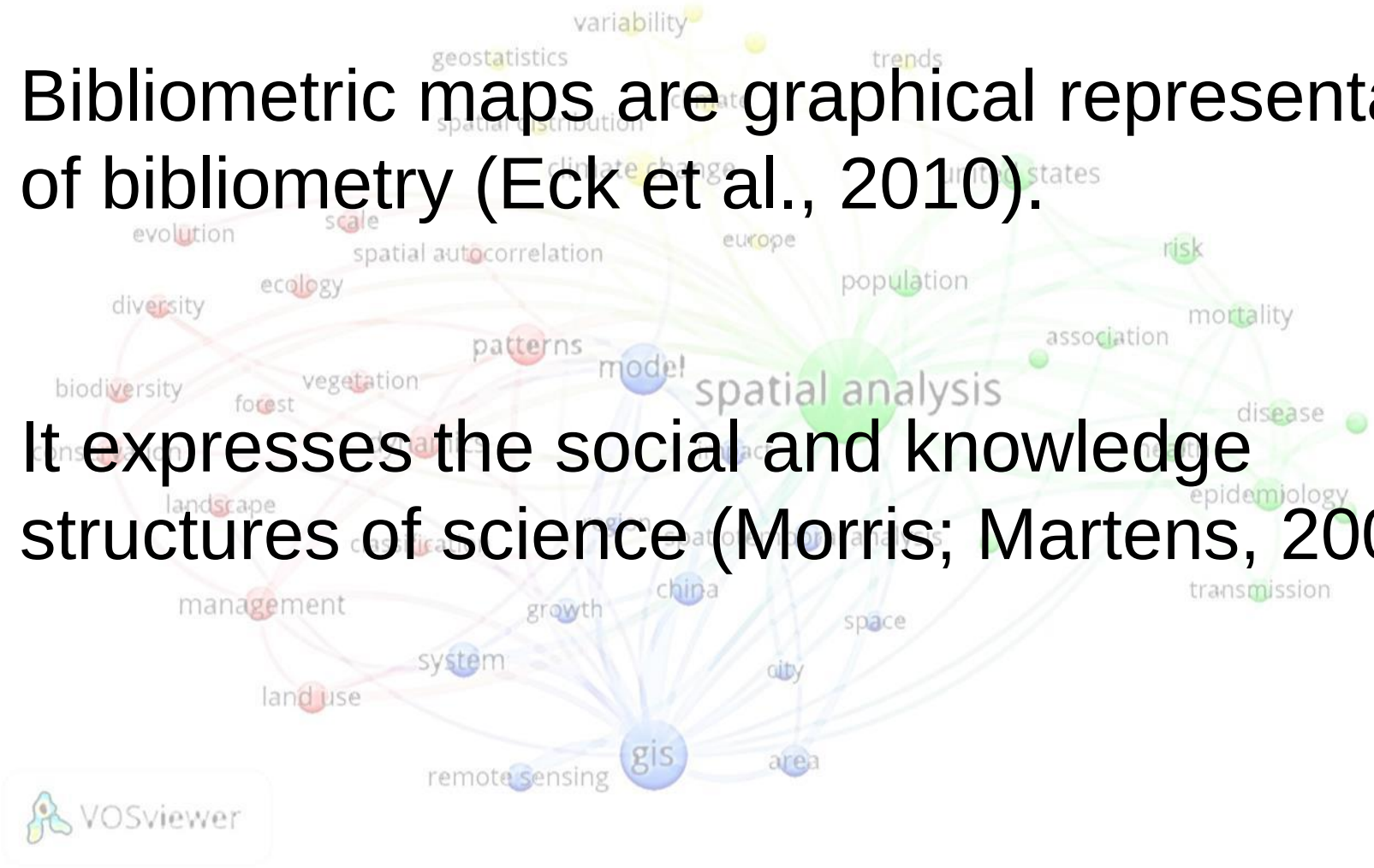
A node represents an academic entity (article, journal, or author) and a link expresses its relationships (citation, co-authoring, co-authoring, bibliographic coupling, or co-word).

Academic networks provide important insights into the interaction of such research.



5. Bibliometric map

Bibliometric maps are graphical representations of bibliometry (Eck et al., 2010).

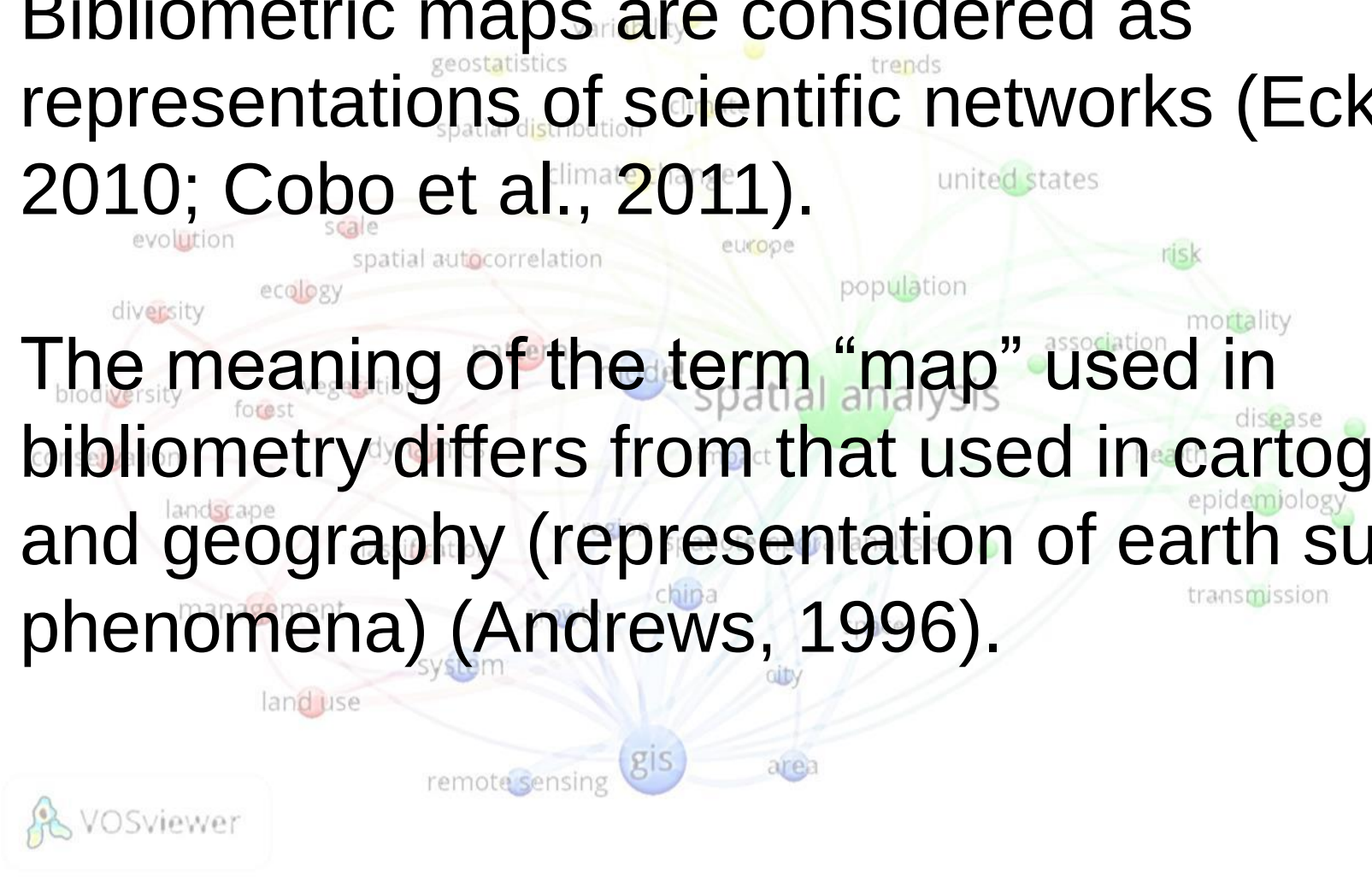


It expresses the social and knowledge structures of science (Morris; Martens, 2008).

5. Bibliometric map

Bibliometric maps are considered as representations of scientific networks (Eck et al., 2010; Cobo et al., 2011).

The meaning of the term “map” used in bibliometry differs from that used in cartography and geography (representation of earth surface phenomena) (Andrews, 1996).



5. Bibliometric map

The bibliometric map is considered as a representation of the structure and interconnection of elements of a known system (Morris; Martens, 2008).

From this point of view, it would be termed as a graph (Martinelli, 2012).

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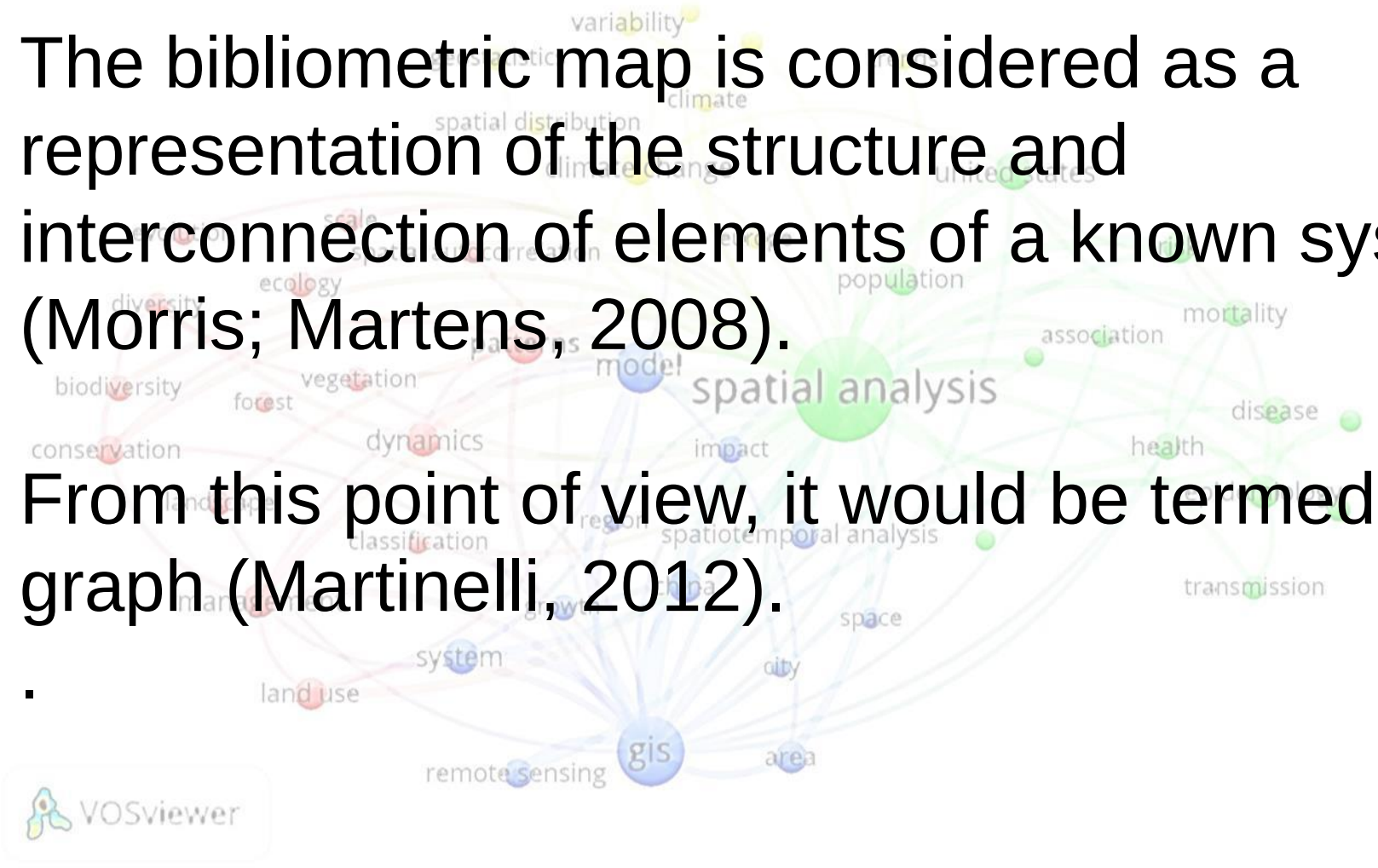
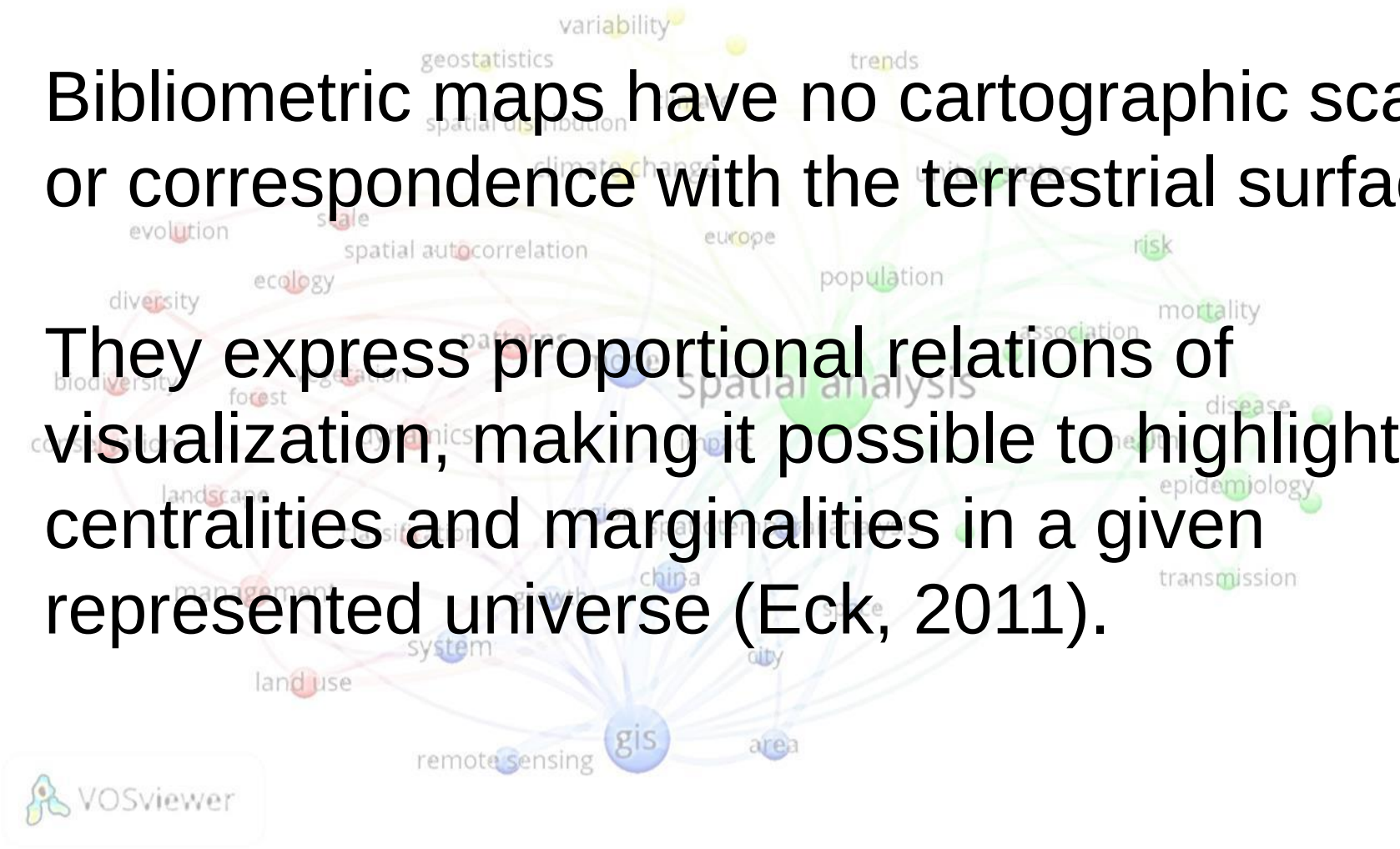


5. Bibliometric map

Bibliometric maps have no cartographic scale or correspondence with the terrestrial surface.

They express proportional relations of visualization, making it possible to highlight centralities and marginalities in a given represented universe (Eck, 2011).

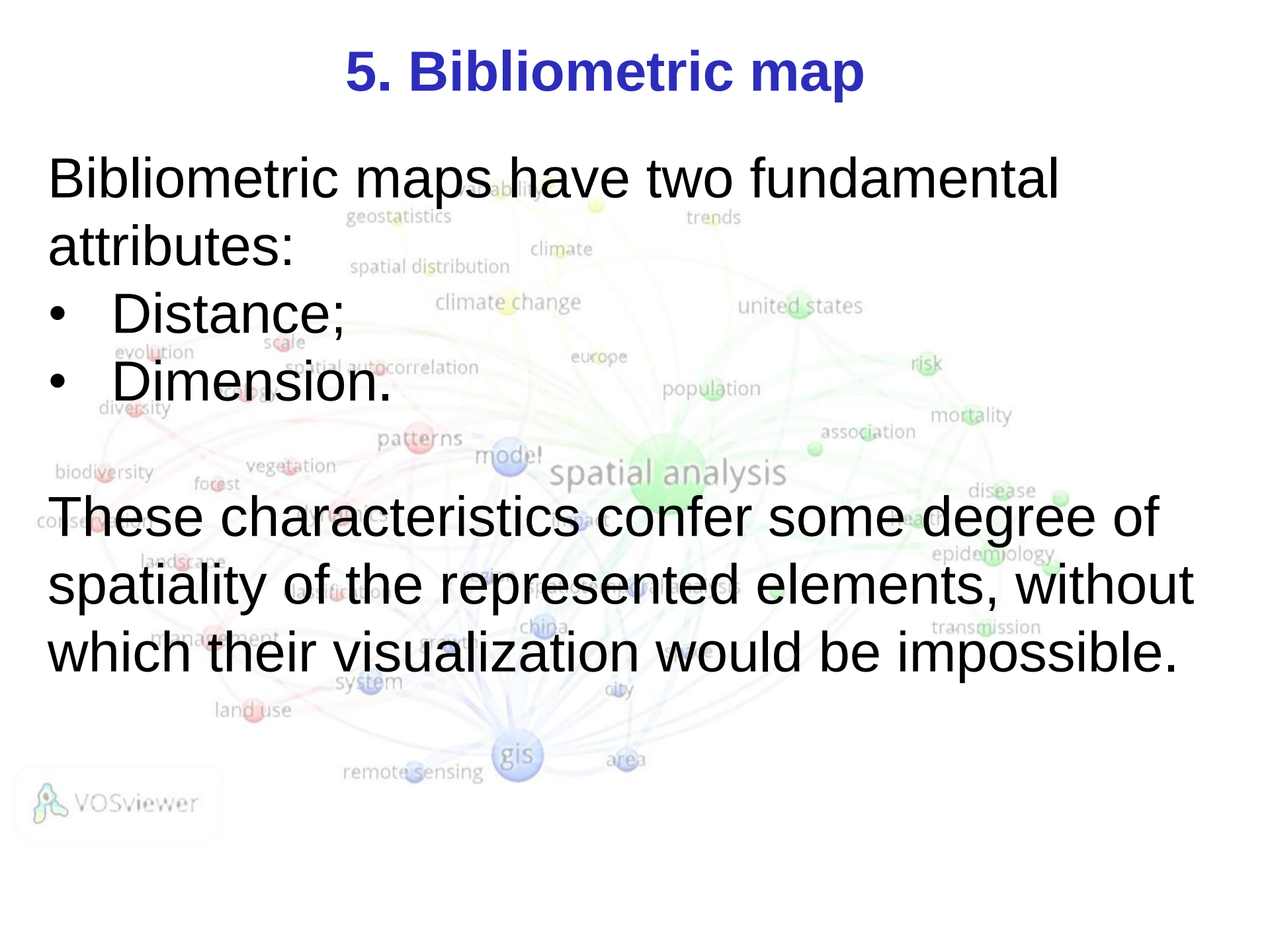


5. Bibliometric map

Bibliometric maps have two fundamental attributes:

- Distance;
- Dimension.

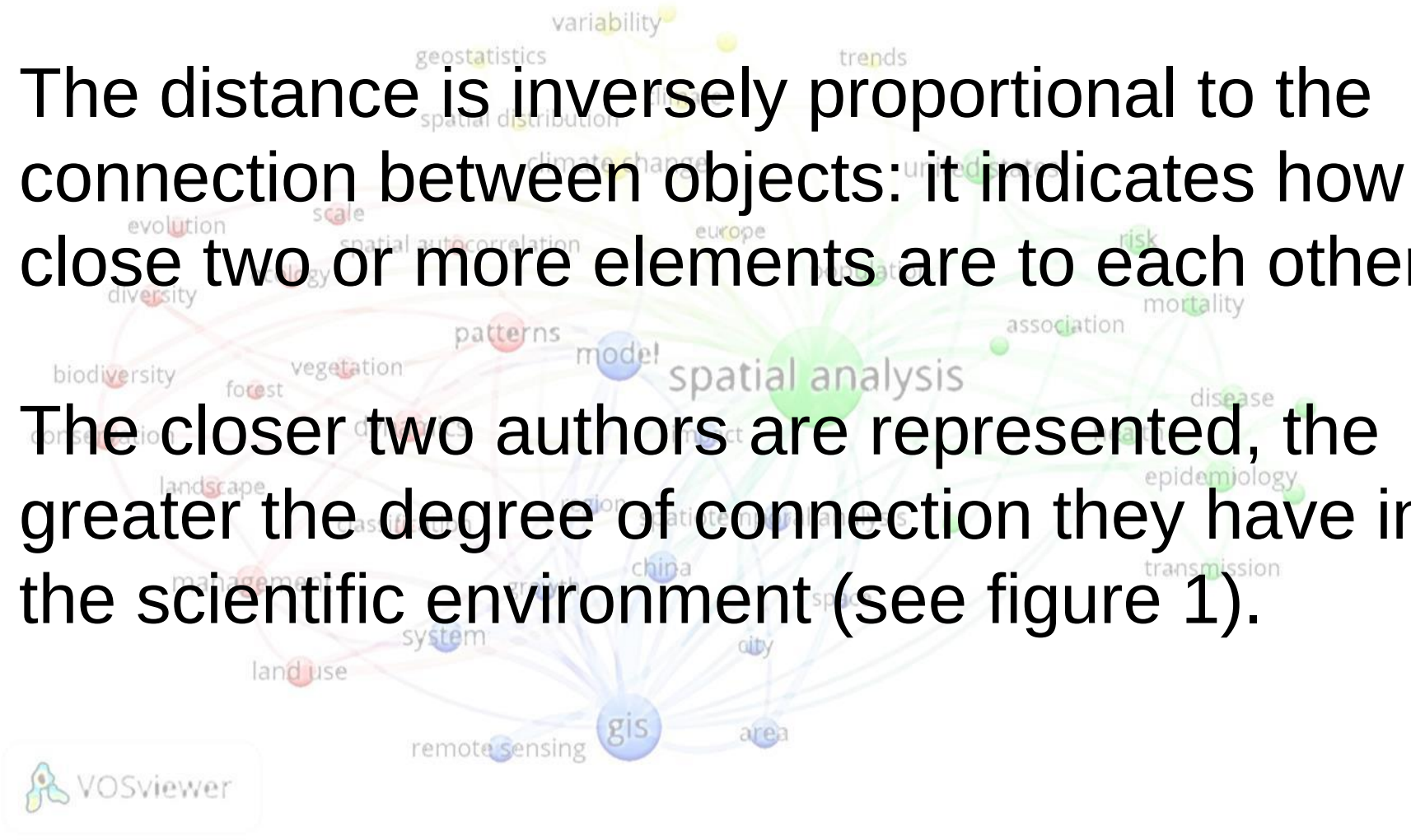
These characteristics confer some degree of spatiality of the represented elements, without which their visualization would be impossible.

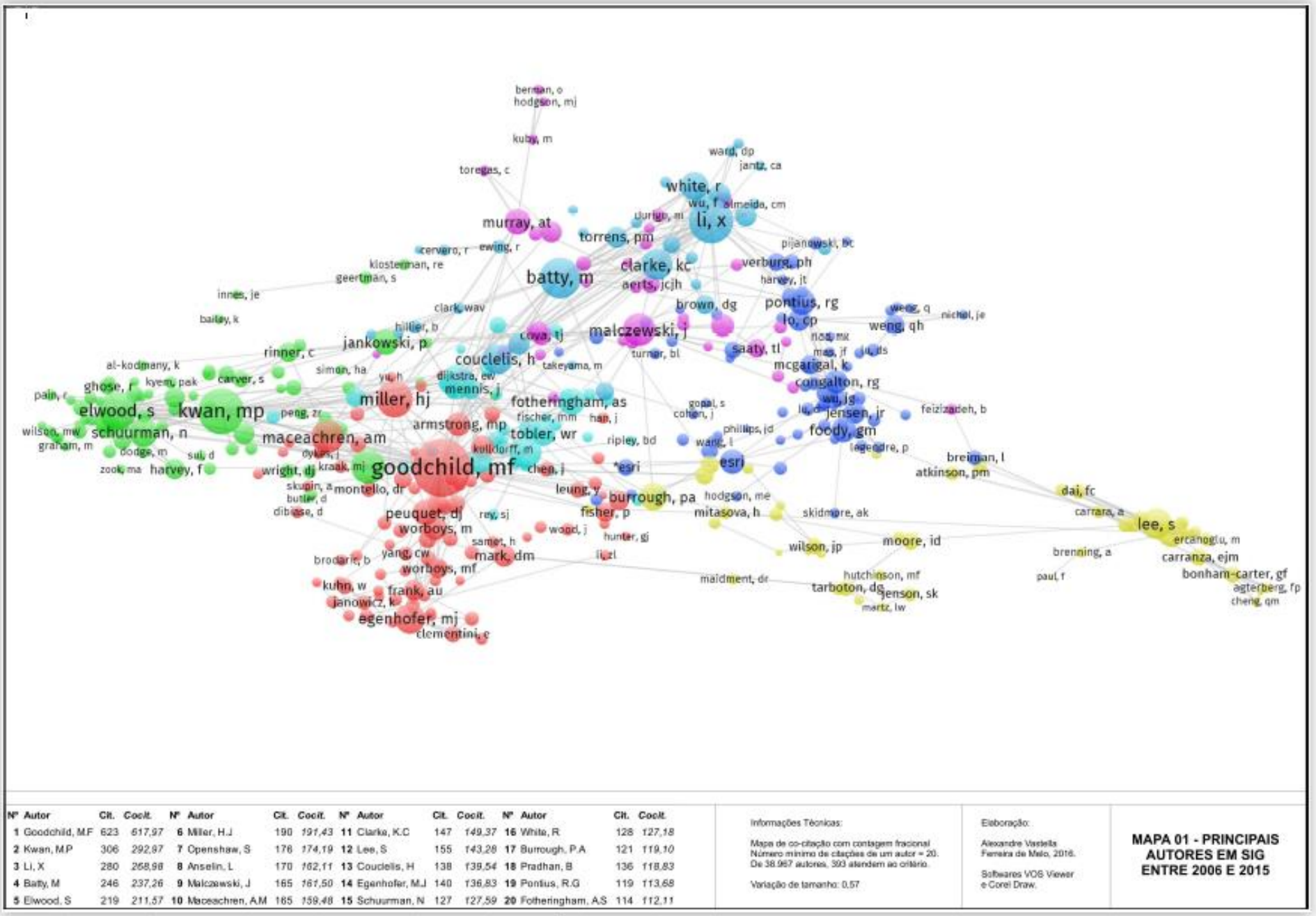


5. Bibliometric map

The distance is inversely proportional to the connection between objects: it indicates how close two or more elements are to each other.

The closer two authors are represented, the greater the degree of connection they have in the scientific environment (see figure 1).





Nº	Autor	Cit.	Cocit.	Nº	Autor	Cit.	Cocit.	Nº	Autor	Cit.	Cocit.	Nº	Autor	Cit.	Cocit.
1	Goodchild, M.F	623	617,97	6	Miller, H.J	190	191,43	11	Clarke, K.C	147	149,37	16	White, R	128	127,18
2	Kwan, M.P	306	292,87	7	Openshaw, S	176	174,19	12	Lee, S	155	143,28	17	Burrough, P.A	121	119,10
3	Li, X	280	268,98	8	Anselin, L	170	162,11	13	Couclelis, H	138	139,54	18	Pradhan, B	136	118,83
4	Batty, M	246	237,26	9	Malczewski, J	165	161,50	14	Egenhofer, M.J	140	136,83	19	Pontius, R.G	119	113,68
5	Elwood, S	219	211,57	10	Maceachren, A.M	165	159,48	15	Schuurman, N	127	127,59	20	Fotheringham, A.S	114	112,11

Informações Técnicas:

Mapa de co-citação com contagem fracional
Número mínimo de citações de um autor = 20.
De 38.967 autores, 393 atendem ao critério.

Variação de tamanho: 0,57

Elaboração:

Alexandre Vastella Ferreira de Melo, 2016.

Softwares VOS Viewer e Corel Draw.

MAPA 01 - PRINCIPAIS AUTORES EM SIG ENTRE 2006 E 2015

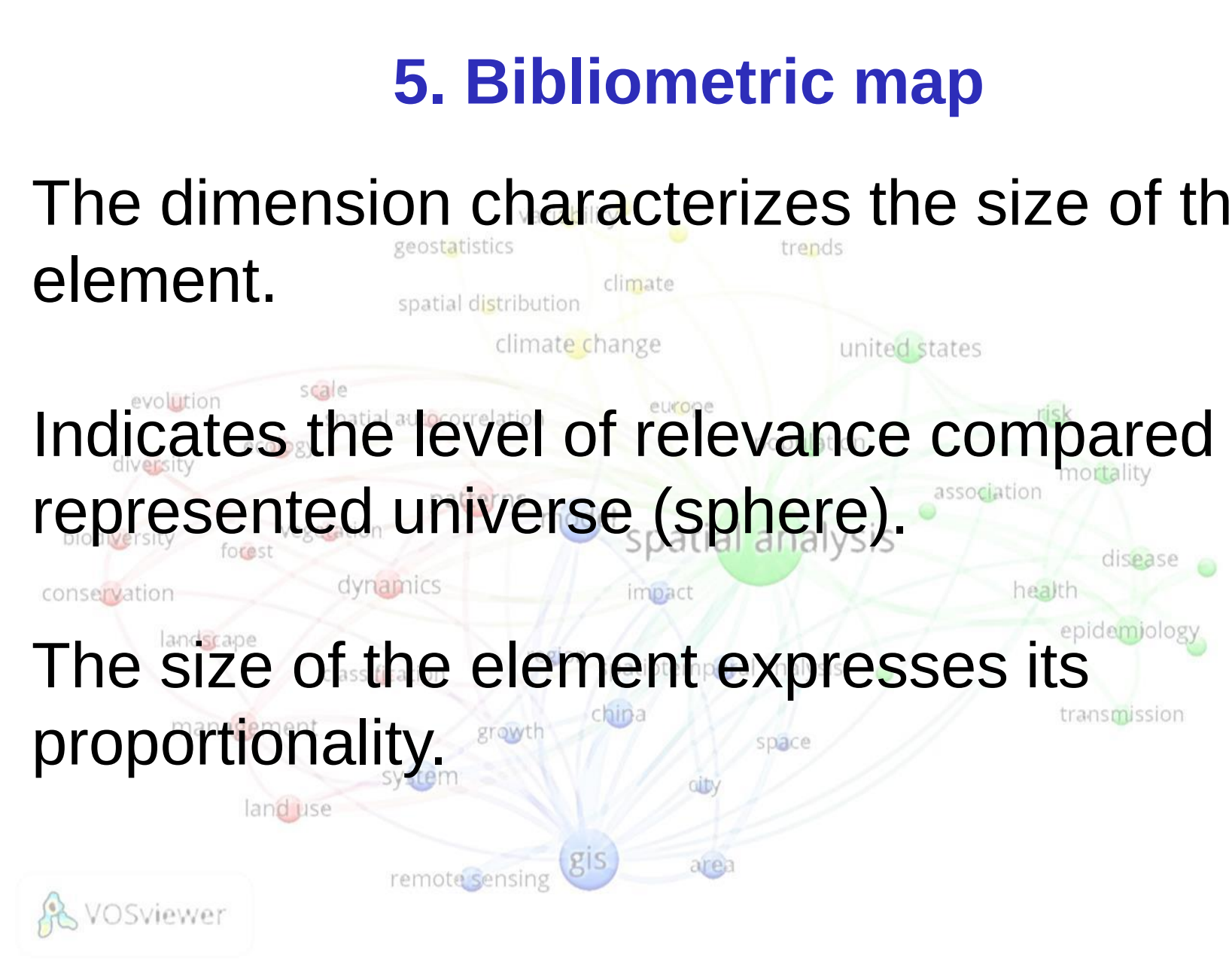
Figura 1: Exemplo de mapa bibliométrico Fonte: Melo, Queiroz (2019)

5. Bibliometric map

The dimension characterizes the size of the element.

Indicates the level of relevance compared to the represented universe (sphere).

The size of the element expresses its proportionality.



5. Bibliometric map

The distances and dimensions of the elements represented produce different groupings on the map.

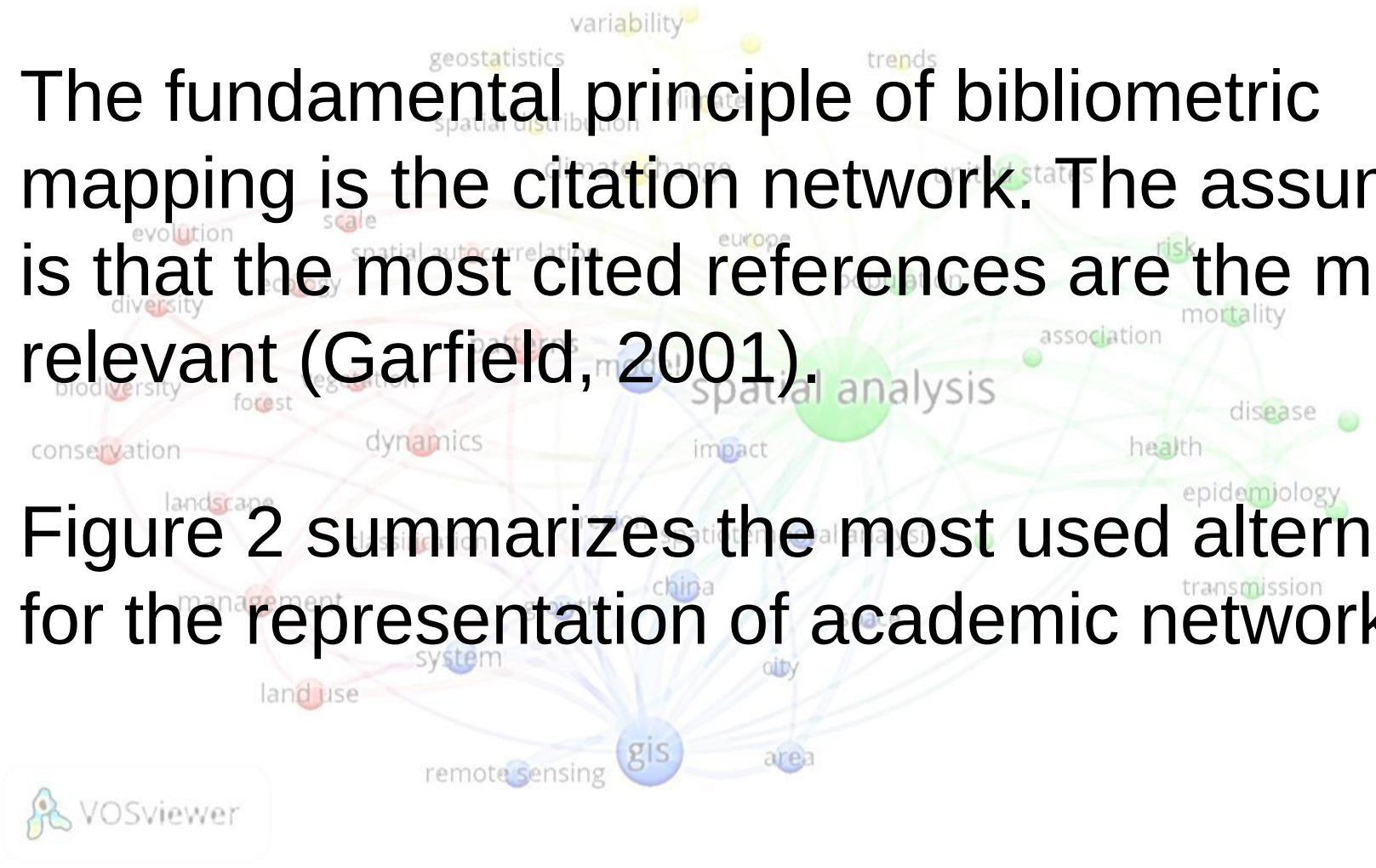
Clusters (concentrations) express similarity levels.

Common themes, or authors from the same research area, tend to be close to a particular portion of the map (Van Raan, 2014).

6. Metrics

The fundamental principle of bibliometric mapping is the citation network. The assumption is that the most cited references are the most relevant (Garfield, 2001).

Figure 2 summarizes the most used alternatives for the representation of academic networks.



6. Metrics

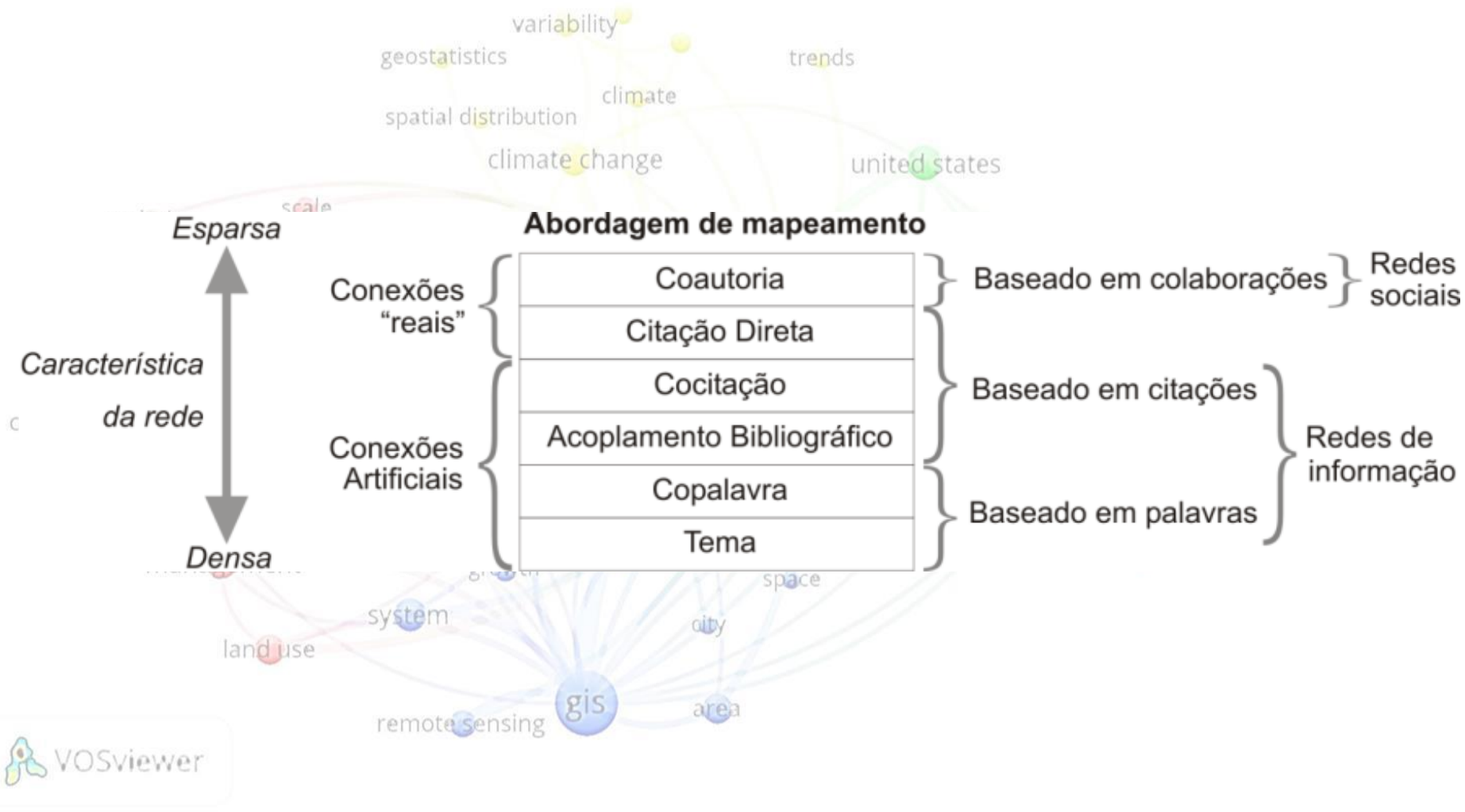


Figura 2: Yan; Ding (2012)

6. Metrics

Bibliographic coupling occurs when two or more articles relate through the same citations (Figure 3).

Articles “A” and “B” connect because they both cite Articles “C”, “D”, “E”, and “F”.

Cocitation expresses the works cited simultaneously. Indicates the most relevant scientific trends in a given area (Eck et al, 2011).

6. Metrics

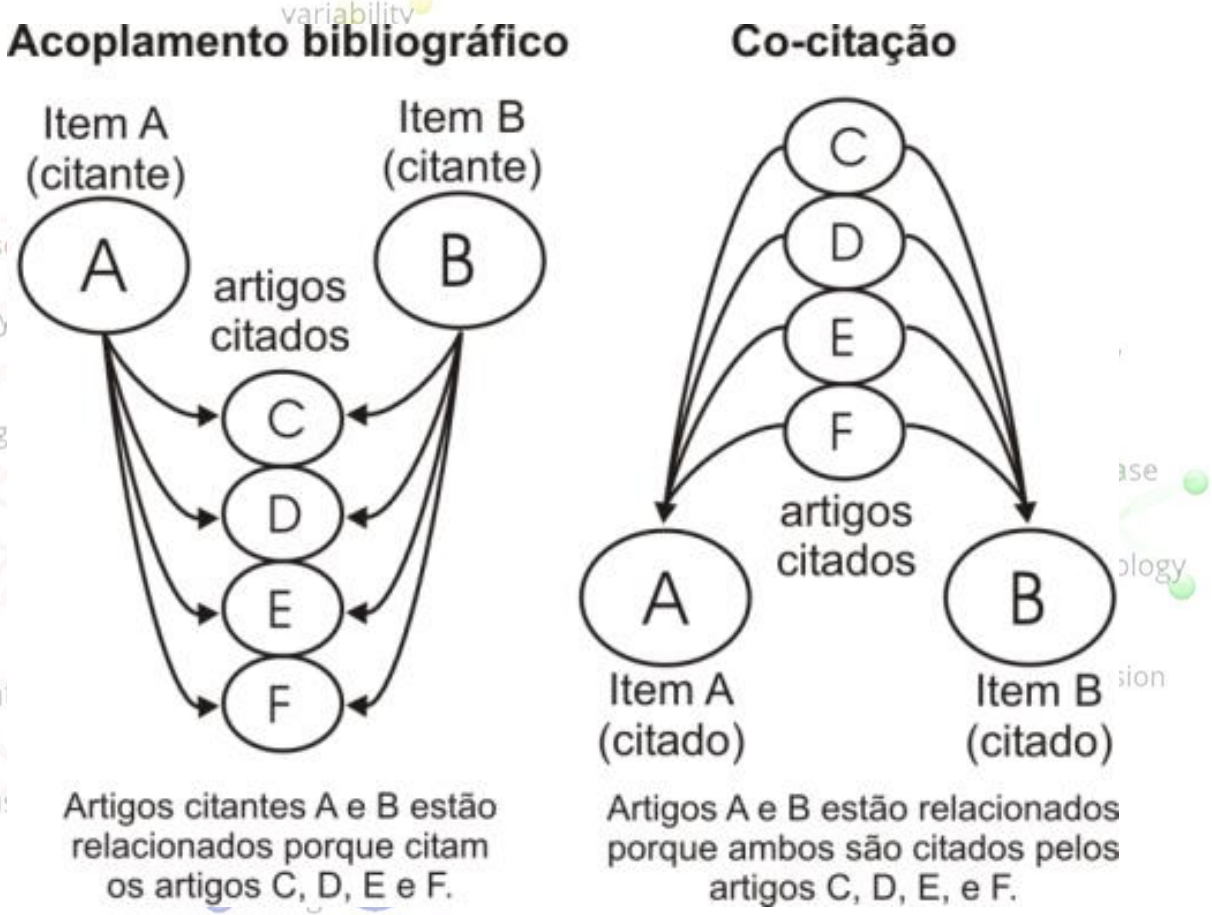
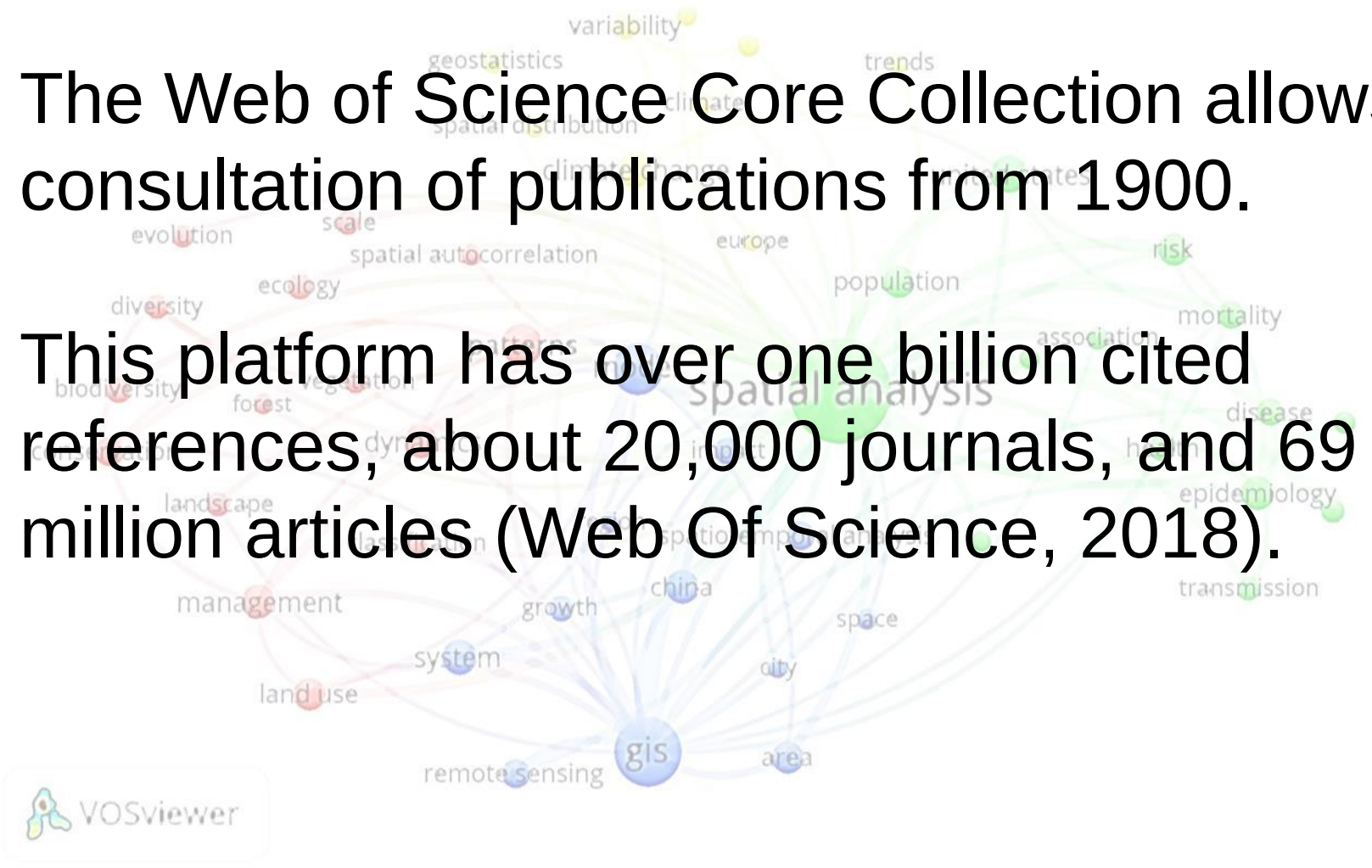


Figura 3: Acoplamento bibliográfico e co-citação
Fonte: Garfield (2001)

7. Data base

The Web of Science Core Collection allows the consultation of publications from 1900.

This platform has over one billion cited references, about 20,000 journals, and 69 million articles (Web Of Science, 2018).



7. Data base

WoS is not a publisher, but an aggregator of scientific content.

The characteristics of the WoS collection files are described in table 1.

Access: http://apps.webofknowledge.com/WOS_GeneralSearch_input.do?product=WOS&search_mode=GeneralSearch&SID=5EDhF52e84FwsrX1KOX&preferencesSaved=
(from USP or by Vpn)

7. Data base

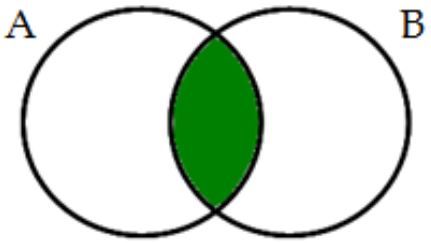
Informações do *Web of Science*	Sigla	Informações do *Web of Science*	Sigla
Nome do arquivo	FN	Contagem de referências citadas	NR
Número da versão	VR	Vezes em que foi citado	TC
Tipo de publicação	PT	Editora	PU
Autores	AU	Cidade da editora	PI
Nome completo do autor	AF	Endereço da editora	PA
Grupo de autores	CA	Categoria de assunto	SC
Título do documento	TI	Issn	SN
Editores	ED	Isbn	BN
Nome da publicação	SO	Data de publicação	PD
Título da série de livros	SE	Ano publicado	PY
Subtítulo da série de livros	BS	Volume	VL
Idioma	LA	Volume	VL
Tipo de documento	DT	Edição	IS
Título da conferência	CT	Parte do número	PN
Data da conferência	CY	Suplemento	SU
Anfitrião da conferência	HO	Edição especial	SI
Local da conferência	CL	Página inicial	BP
Patrocinadores da conferência	SP	Página final	EP
Palavras-chave fornecidas pelo autor	DE	Número do artigo	AR
Keywords plus	ID	Contagem de páginas	PG
Resumo	AB	Identificador digital do objeto	DOI
Endereço do autor	C1	Categoria de assunto	SC
Endereço de reimpressão	RP	Número de entrega do documento	GA
Endereço de email	EM	Identificador único do artigo	UT
Número da agência de financiamento	FU	Final de gravação	ER
Texto de financiamento	FX	Final de arquivo	EF
Referências citadas	CR		

Adaptado de Web of Science, 2015.

7. Data base

Search references in databases

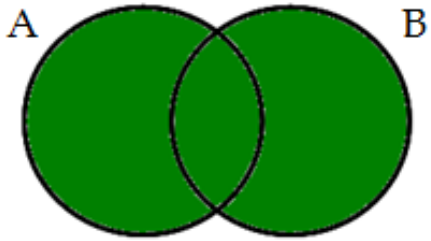
AND



Resposta contém ambos termos A e B. (agrupa os termos).

Relaciona

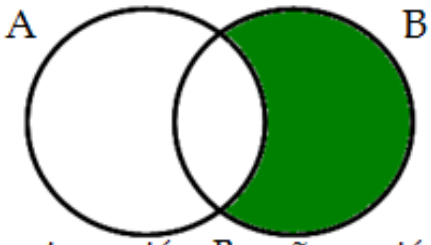
OR



Resposta contém A e/ou B. (qualquer um dos dois).

Soma

NOT



Resposta contém B e não contém A. Utilizado para excluir um dos termos.

Exclui

PROXIMIDADE

Se você quer pesquisar por uma expressão exata, deverá colocá-la entre aspas.

TRUNCAGEM

Para recuperar variações de formas no plural ou diferenças na grafia, utilize os operadores de truncagem.

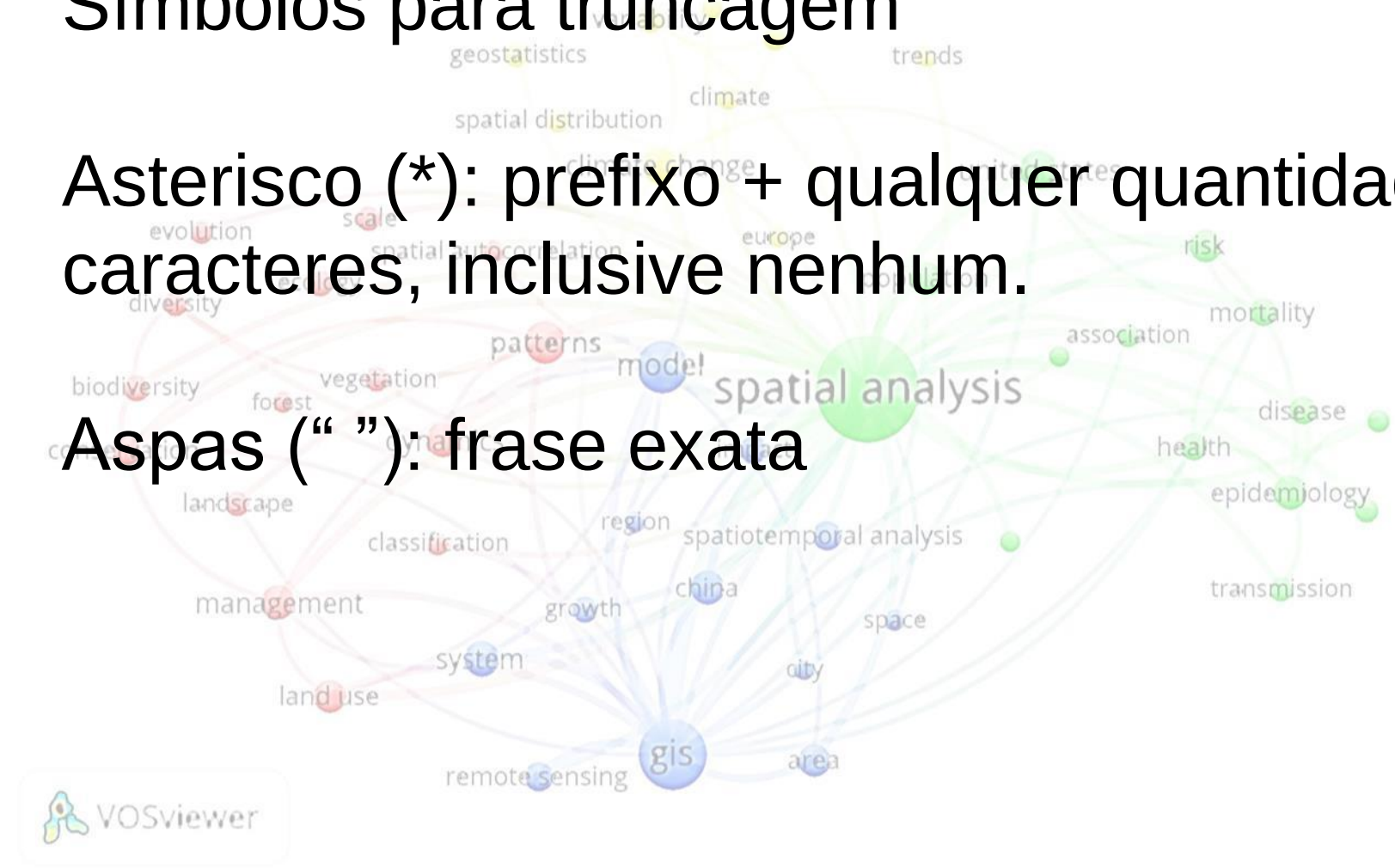
Fonte: FMUSP

7. Data base

Símbolos para truncagem

Asterisco (*): prefixo + qualquer quantidade de caracteres, inclusive nenhum.

Aspas (“ ”): frase exata



8. Software

VOSViewer (free) from the University of Leiden, the Netherlands. It is based on the homonymous mathematical procedure (visualization of similarities).

Its goal is to provide a visualization “in which objects are located such that the distance between any pair of objects reflects their resemblance as accurately as possible” (Eck, Waltman; 2007).

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