

CMCC WEBINAR

April 17, 2018 - h. 12:30 pm CEST

“Mapping innovation: a global outlook of Climate Services”

Francesca Larosa

*Fondazione CMCC – Centro Euro-Mediterraneo
sui Cambiamenti Climatici,
Ca' Foscari University of Venice*

Antonio Bombelli - Moderator

*Fondazione CMCC – Centro Euro-Mediterraneo
sui Cambiamenti Climatici*



To investigate and model our **climate system** and its interactions with **society** to provide reliable, rigorous, and timely **scientific results**, which will in turn stimulate sustainable growth, protect the **environment**, and **develop science driven** adaptation and **mitigation policies** in a **changing climate**



MISSION



NETWORK



ASC

Advanced Scientific
Computing

CSP

Climate Simulation
and Prediction

ECIP

Economic Analysis of
Climate Impacts and Policy

IAFES

Impacts on Agriculture, Forest
and Ecosystem Services

ODA

Ocean Modelling
and Data Assimilation

OPA

Ocean Predictions
and Applications

RAAS

Risk Assessment and
Adaptation Strategies

REMHI

Regional Models and
Hydrogeological Impacts

**RESEARCH
DIVISIONS**



TOPICS

Modelling
Policy Adaptation
Agriculture Society
Predictions Impacts
Hydrogeology
Forests Simulations
Oceans Ecosystems
Computing
Services





Publications



Events



Education



Communication

OUTREACH



Q&A session



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Aim of the work

Mapping the landscape of climate innovation in Europe and beyond, by focusing on research on Climate Services

- Analysis of socio-centric and ego-centric bibliographic networks

1

Bibliometrics

- Assessment of the main characteristics of co-authorship networks' and identification of the poles of innovations in Europe

2

Social Network Analysis

- Identification of the most relevant topics tackled by authors

3

Content analysis



Tackling climate innovation: climate services



“Timely production, translation and delivery of useful climate data, information and knowledge” (Board on Atmospheric Sciences and Climate, **2001**)



“CSs provide climate information in a way that assists decision making by individuals and organizations. Such services require appropriate engagement along with an effective access mechanism and must respond to user needs (Global Framework for Climate Services, **2009**)



“the transformation of climate-related data — together with other relevant information — into customised products such as projections, forecasts, information, trends, economic analysis, assessments (including technology assessment), counselling on best practices, development and evaluation of solutions and any other service in relation to climate that may be of use for the society at large” (European Roadmap for Climate Services, **2015**)



Building bibliometric networks

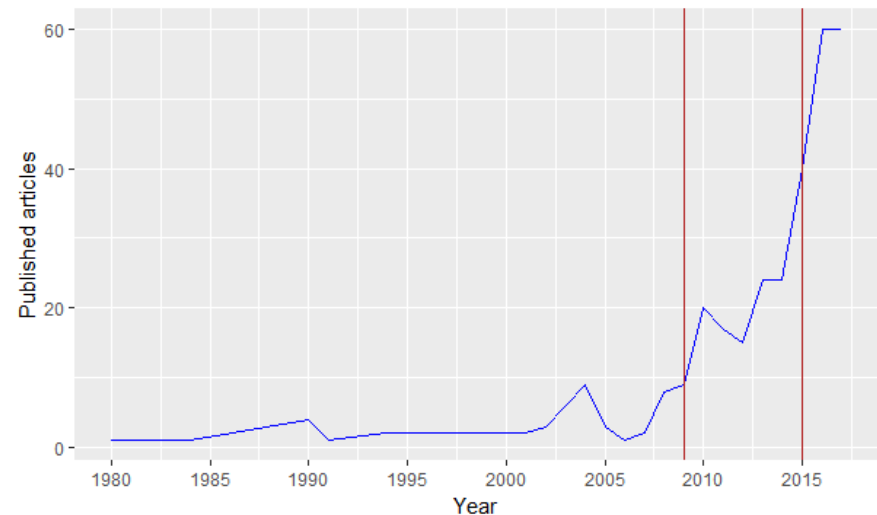
- Query in Scopus database, cross-checked with Web of Science
- Included documents: peer-reviewed articles, book chapters, books, conference proceedings, press articles and reports;
- 330 records in 173 sources: 95% co-authored; 12% annual growth rate since 1980

Descriptive statistics

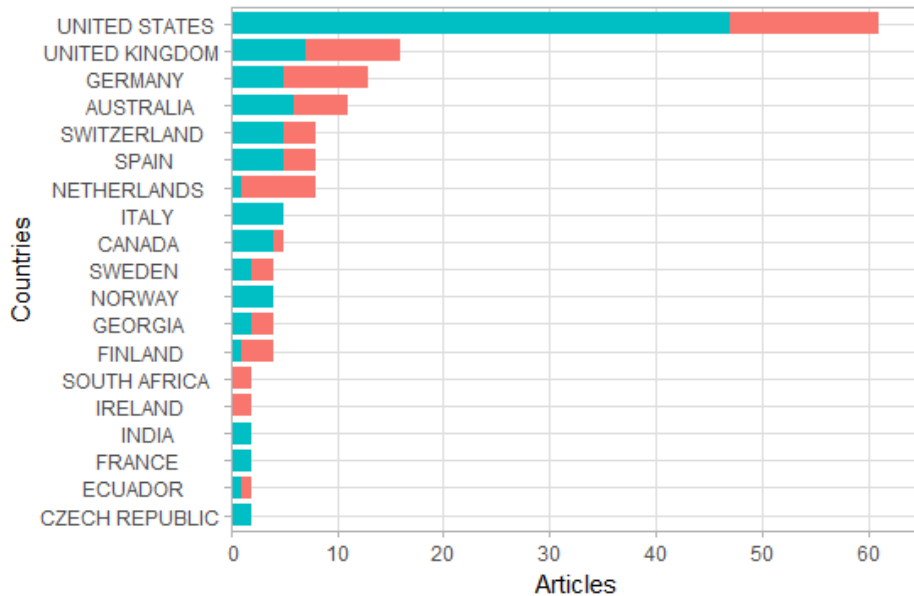
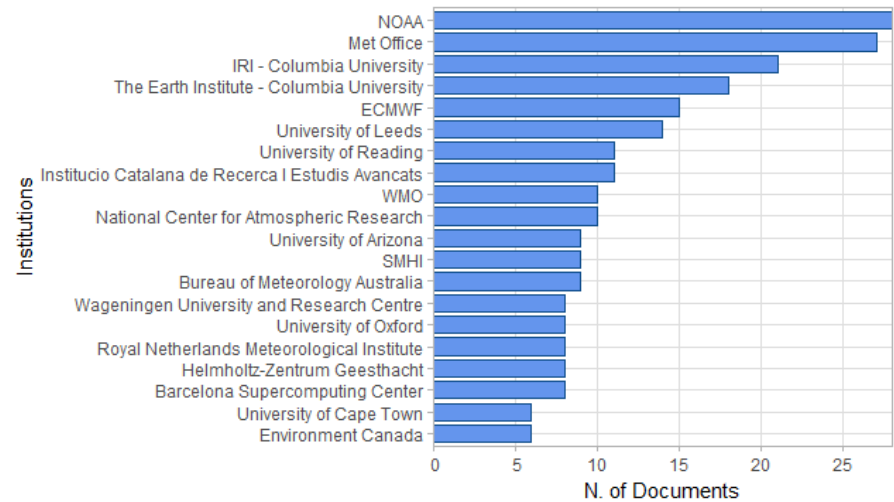
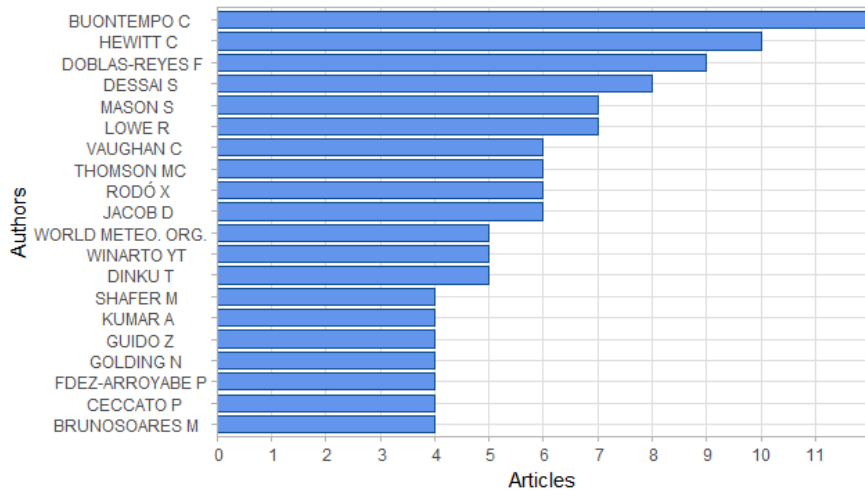
Table 1. Descriptive statistics of the sample

Articles	330
Sources (Journals, Books, etc.)	173
Keywords Plus (ID)	1480
Author's Keywords (DE)	573
Period	1980-2018
Average citations per article	11.7
Authors	1203
Authors of single authored articles	56
Authors of multi authored articles	1147
Articles per Author	0.27
Authors per Article	3.65
Co-Authors per Articles	4.54
Collaboration Index	4.55

Annual scientific production



Building bibliometric networks (cont.)

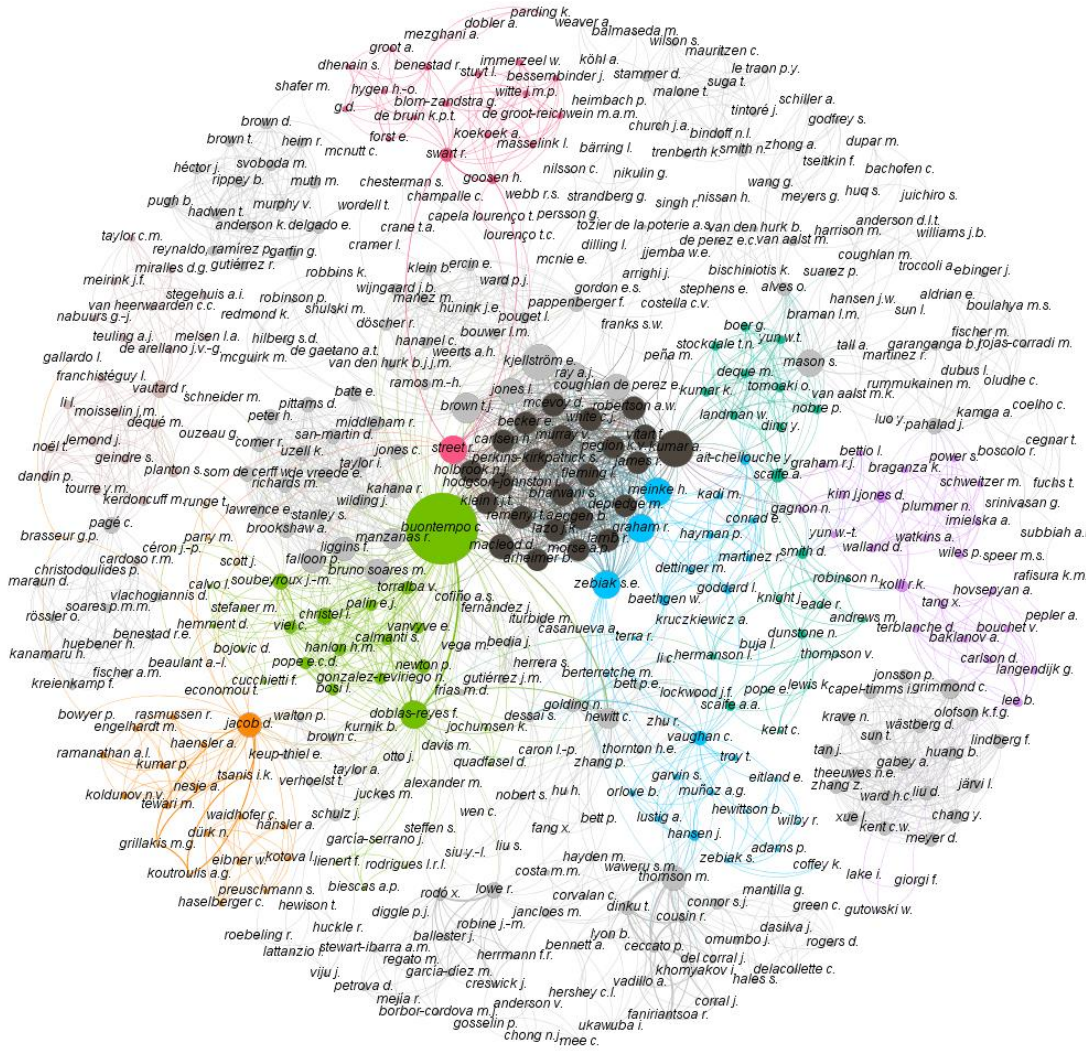


Sources	Articles
Bulletin of The American Meteorological Society	30
Climate Services	29
Procedia Environmental Sciences	10
Climate Risk Management	9
Climatic Change	8
Climate Research	7
Weather Climate and Society	6
Climate in Context: Science and Society Partnering for Adaptation	5
International Journal of Environmental Research and Public Health	5
Journal of Applied Meteorology and Climatology	5
International Journal of Climatology	4
Wiley Interdisciplinary Reviews: Climate Change	4
World Scientific Series on Asia-Pacific Weather and Climate	4
Climate and Development	3
Climate Dynamics	3
Environmental Research Letters	3
Meteorological Applications	3
Nature Climate Change	3
Regional Environmental Change	3
Science of The Total Environment	3

type
■ MCP
■ SCP



Inside the socio-centric co-authorship network

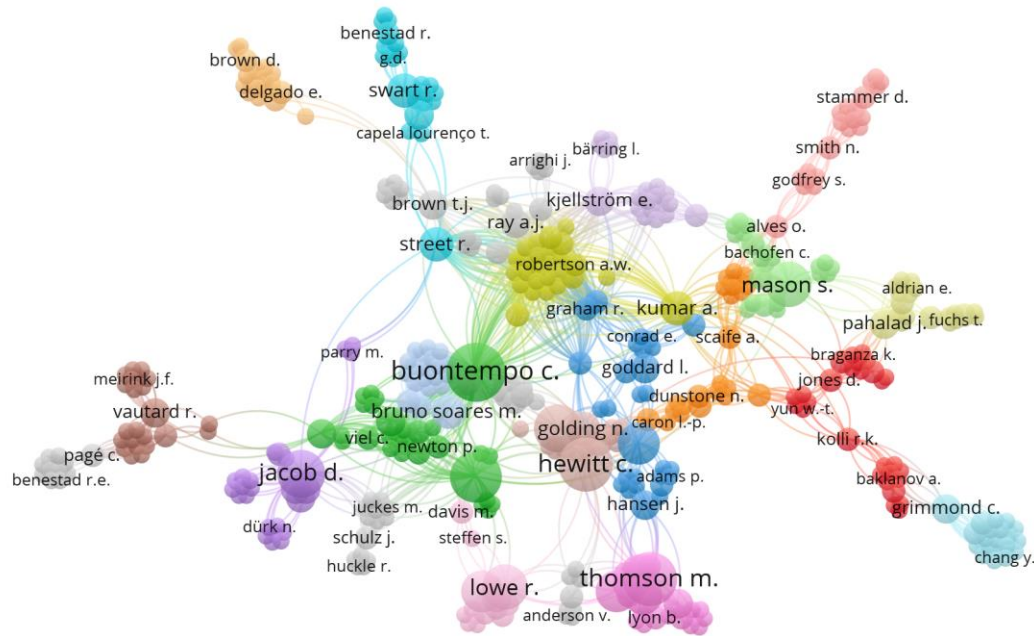


Undirect weighted graph:

- Weights: #publications
- **468 authors** are connected in the central network
- Analysis on the structure (*cohesion*) of the network using SNA statistics reveal a loose graph:
 - $Density = 0.0069$
 - $Degree\ centrality\ (av.): 8.56$
- Focus on the largest connected sub-network



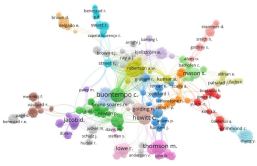
Inside the socio-centric co-authorship network



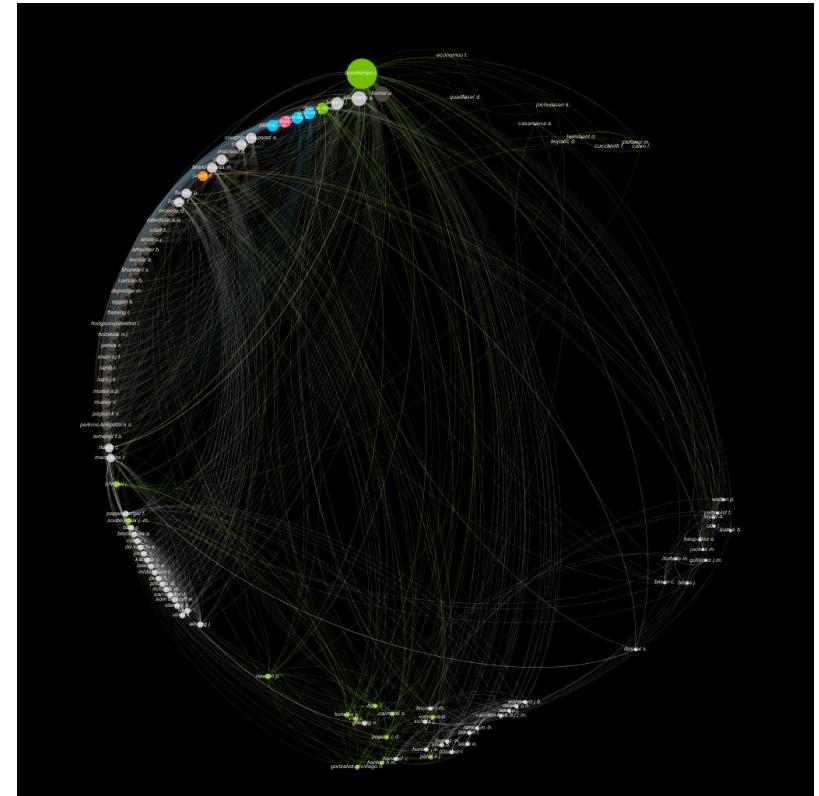
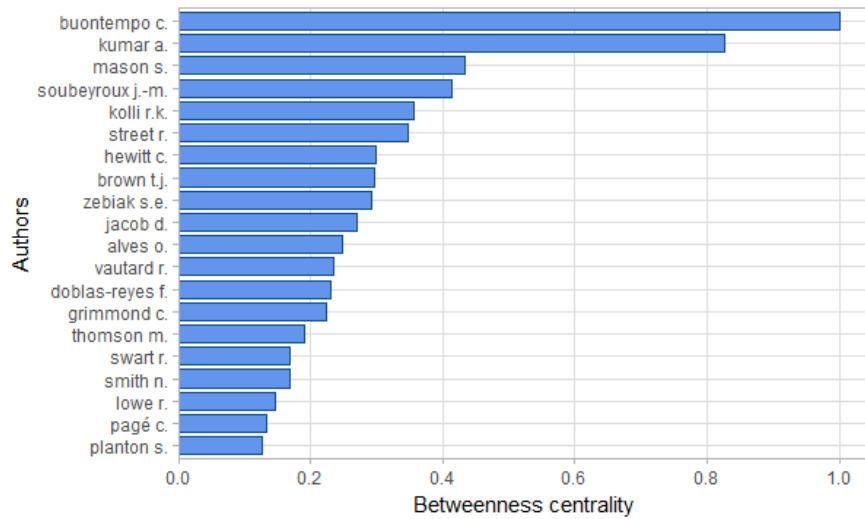
- 25 sub-clusters weighted on the #published records using the Louvain method (*Blondel et al., 2008*);
- Higher density than full network = 0.026 (>0.0069);
- Analysis of the «popularity» of actors (*degree centrality*) reports Buontempo C. (106), Kumar A. (54). Kjellström E. (52) and Doblas-Reyes (41) in top positions, with an average of 12, indicating that many authors are poorly connected;
- 10 cliques (subgraphs 3+ nodes directly connected)



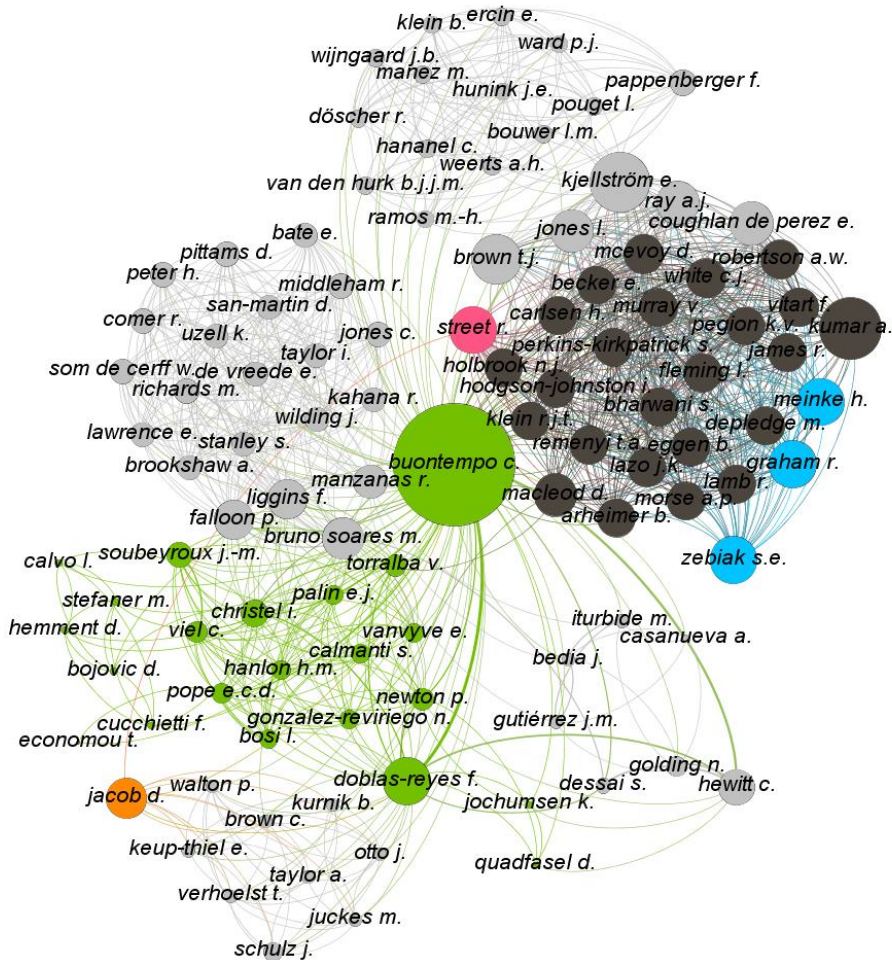
Moving towards an ego-centric network



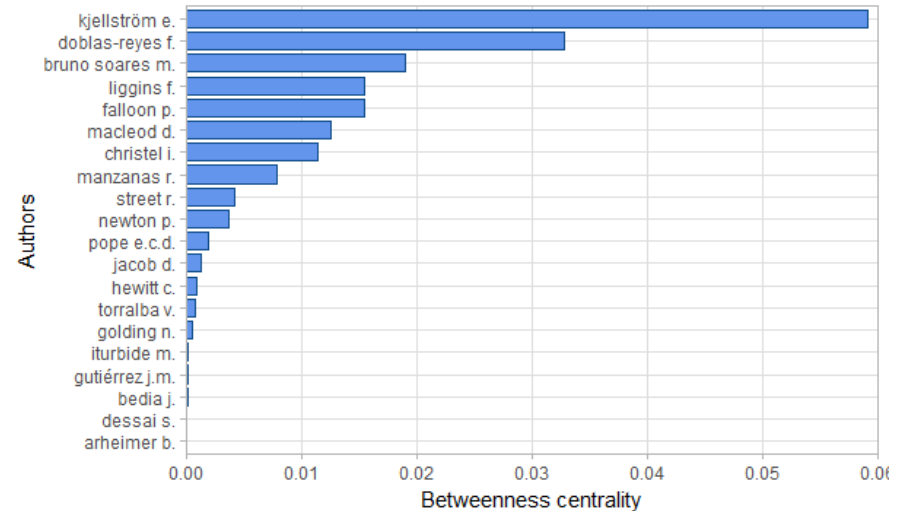
Main network. Betweenness centrality



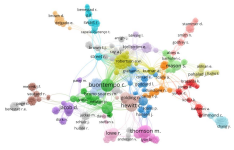
The ego-centric network



- Much more cohesive than the previous two:
 - Density: 0.2057
 - Degree centrality: 22%
- In the analysis of betweenness centrality, key authors are overlapping with socio-centric one (Street, Jakob, Kjelleström), proving the ego-network is central



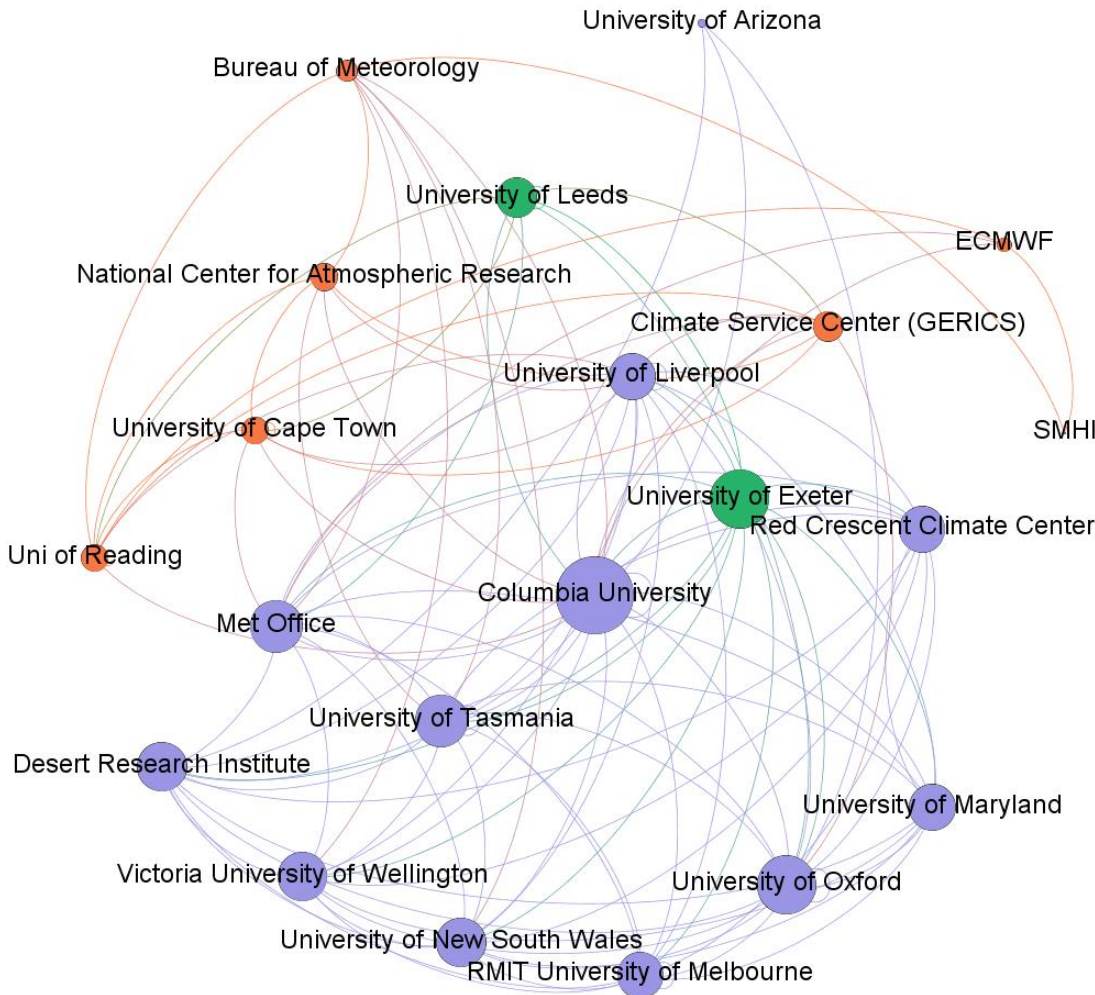
The country level network



- 63 countries are included in the main network
- English-speaking countries (United States and United Kingdom) are confirmed the top connected (betweenness centrality and degree), followed by Germany, Switzerland, France and Spain
- Findings confirm the positioning previously found in other climate-related studies (Zare et al., 2017; Corbera et al., 2015; Costanza and Kubiszewski, 2012)



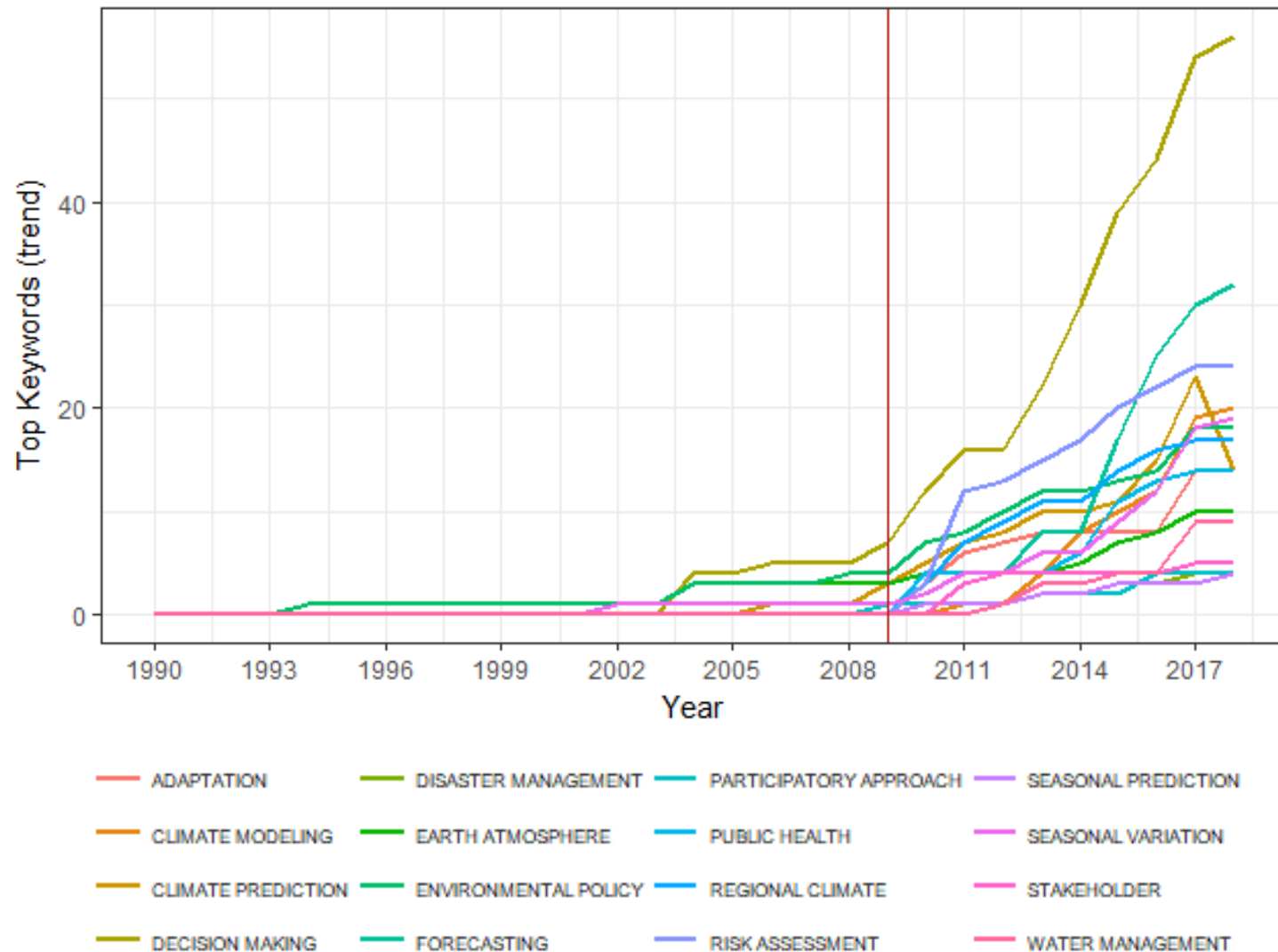
The institutional level: degree vs betweenness



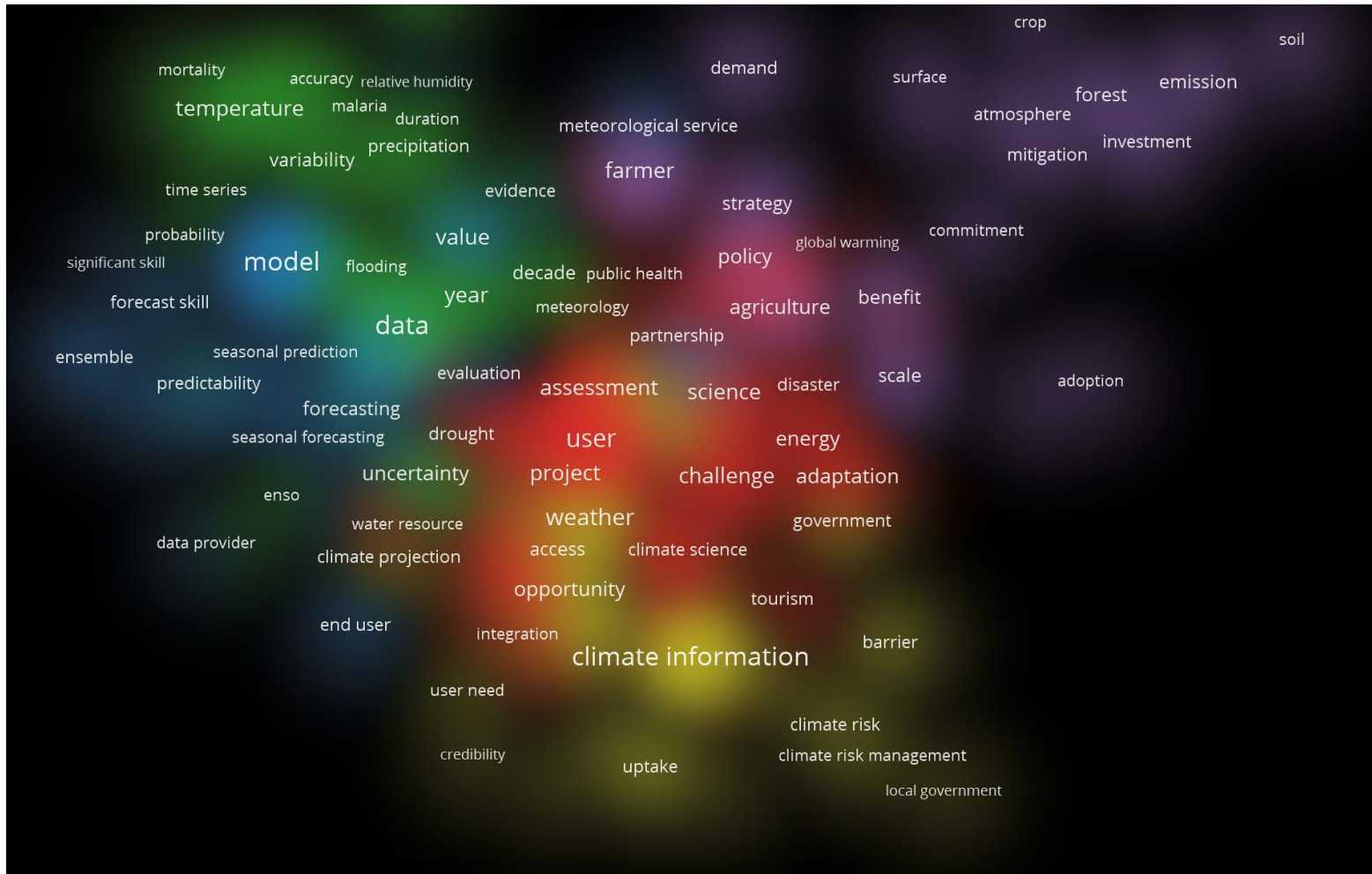
Institutions	betweenness
Columbia University	0.1818
Met Office	0.0924
Bureau of Meteorology AUS	0.0755
University of Liverpool	0.0569
University of Oxford	0.0410
ECMWF	0.0290
University of Tasmania	0.0257
University of Reading	0.0239
Desert Research Institute	0.0157
Victoria University of Wellington	0.0121
University of New South Wales	0.0121
University of Exeter	0.0099
National Center for Atmospheric Research	0.0090
Climate Service Center (GERICS)	0.0073
University of Leeds	0.0072
University of Cape Town	0.0036
SMHI	0.0013
University of Maryland	0.0
University of Arizona	0.0
RMIT University of Melbourne	0.0
Red Crescent Climate Center	0.0



Inside the content: content analysis

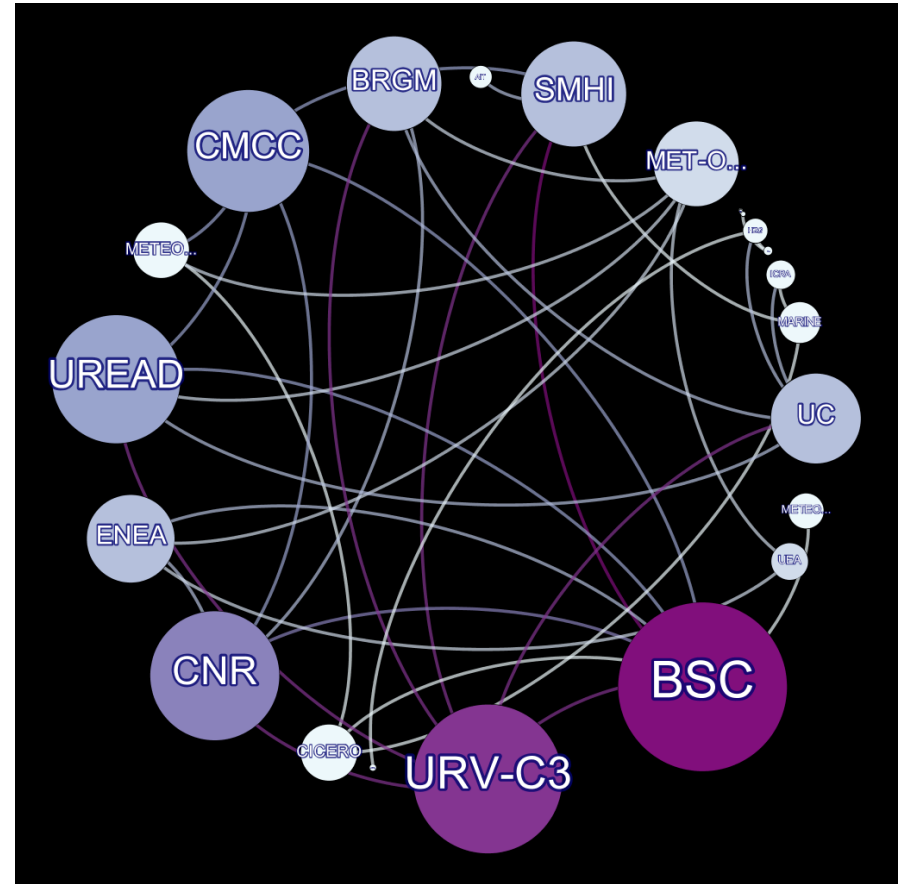
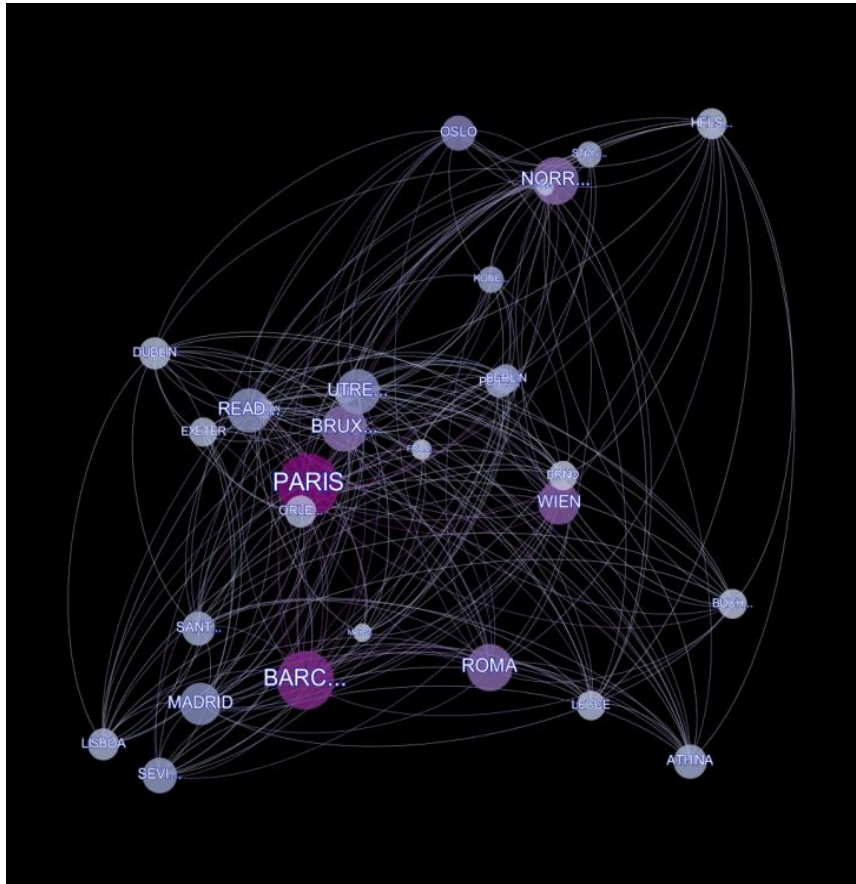


Inside the content: abstract cluster analysis

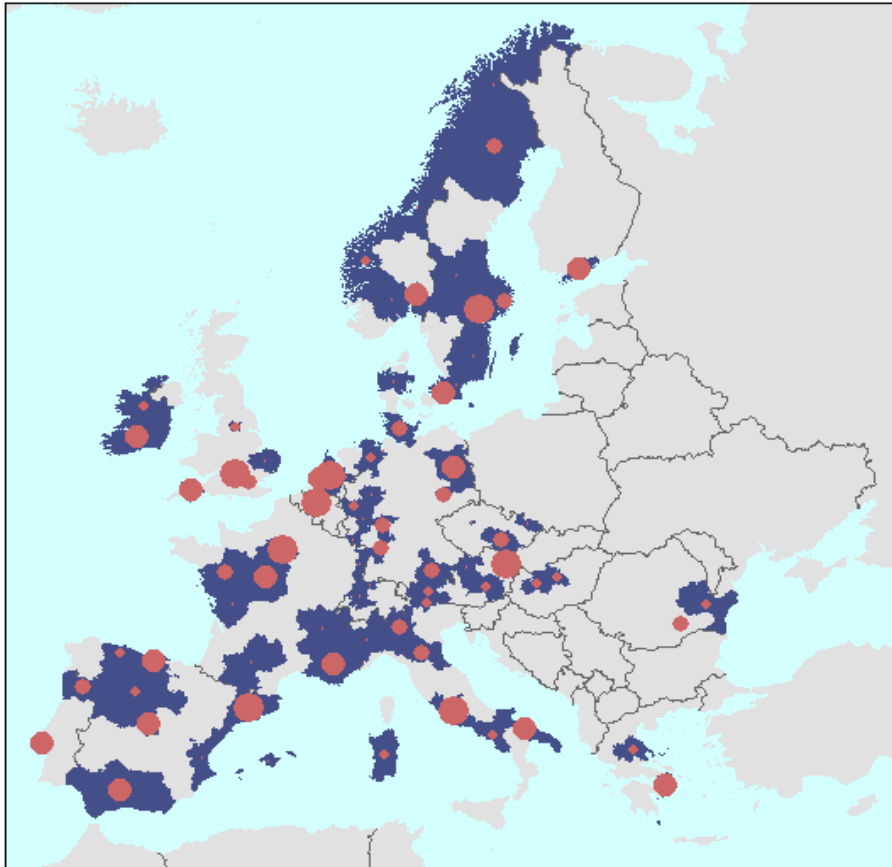


Identifying the poles of innovation in Europe

- Collection of data from CORDIS and ERA4CS database: 35 research projects (Horizon2020 and ERA4CS 2016-2017)
- Analysis of competitiveness between NUTS2 regions, and SNA between coordinating entities, key partners and countries



Discussion and conclusions



eigencentrality

- 0,021611 - 0,181543
- ◆ 0,181544 - 0,315387
- ◆ 0,315388 - 0,436561
- 0,436562 - 0,630866
- 0,630867 - 1,000000

- Interest in CSs has significantly increased (+12%) since 1980: multiple actors and disciplines are feeding a vibrant world
- A small sample of individual scholars presents high betweenness centrality, driving the information flows
- English-speaking and Western continental EU countries are dominant in shaping research on CSs
- The dynamic content analysis of abstract reveals CSs are progressively shifting the attention towards adaptation-focused and user-centered perspectives
- Analysis from projects at EU level demonstrates a clear North-West vs South-East climate knowledge divide in EU, with a small cluster of organisations dominating the knowledge flow
- There is a moderate link between innovation&competitiveness environment and intensity of climate innovation (#projects secured)



Reactions and feedbacks mostly welcome!

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Q&A session



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Forthcoming CMCC Webinar

“Water management: innovative ways to assess precipitation spatial distribution”

Presenter: Paola Marson
CMCC, «Ocean Predictions and Applications» Division

*29 May 2018
12:30 pm CEST*



Thank you for attending this CMCC webinar.

This webinar was recorded and will be uploaded to the CMCC website: www.cmcc.it

If you have any further question about the webinar, please email: webinar@cmcc.it