

Team Structure in Climate Change Research

Travis Franck

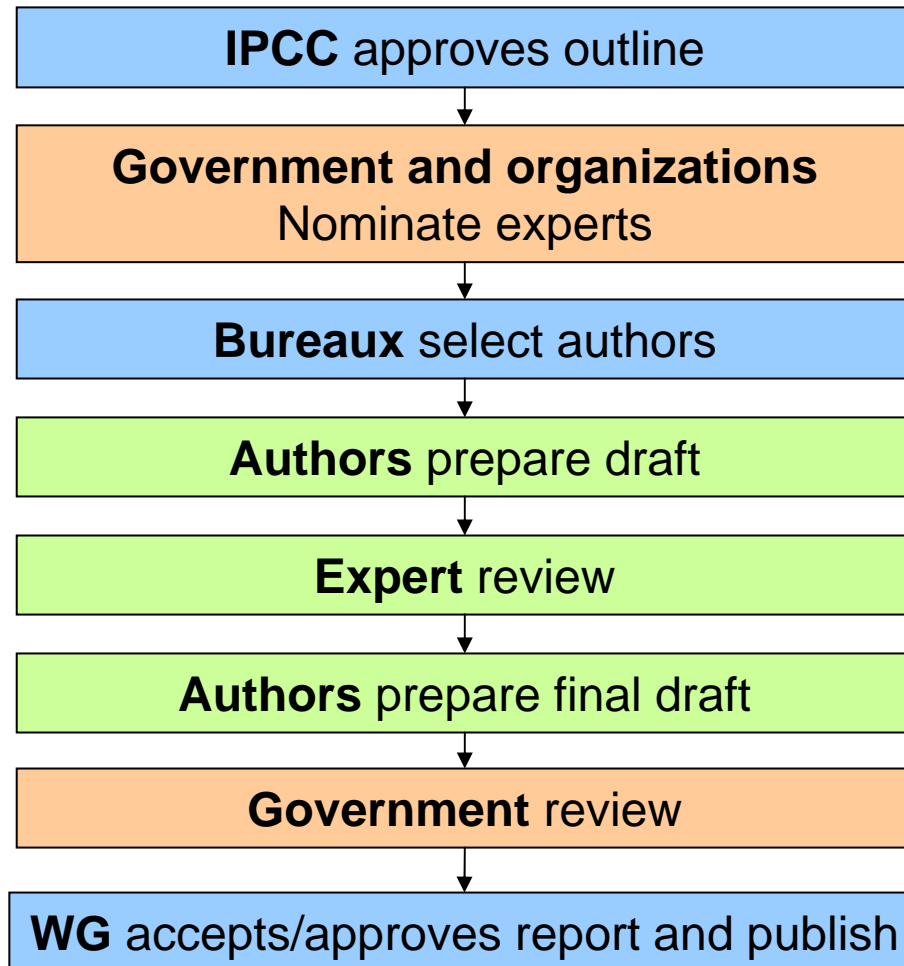
Robert Nicol

Jaemin Song

Agenda

- Introduction
- Update from 2nd Presentation
- Results of Network Analysis
 - Characteristics of entire network
 - Characteristics of individual volume
- Lessons for international research projects

IPCC Report Preparation Process



1990: IPCC First Assessment Report
1995: IPCC First Assessment Report
2001: IPCC First Assessment Report

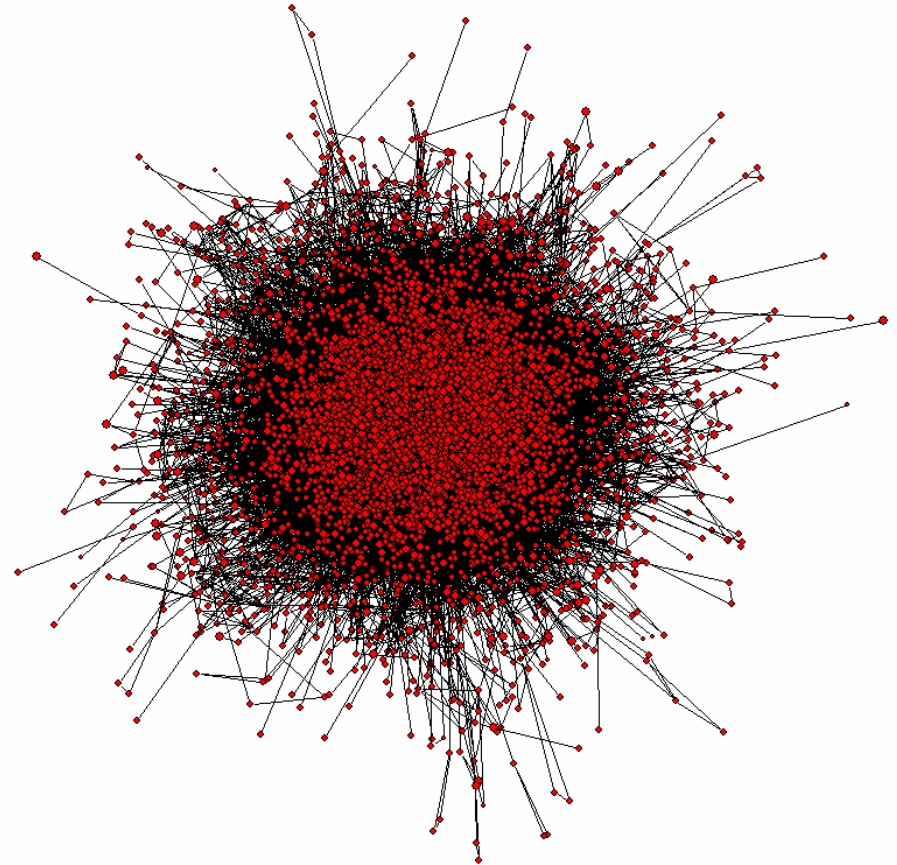
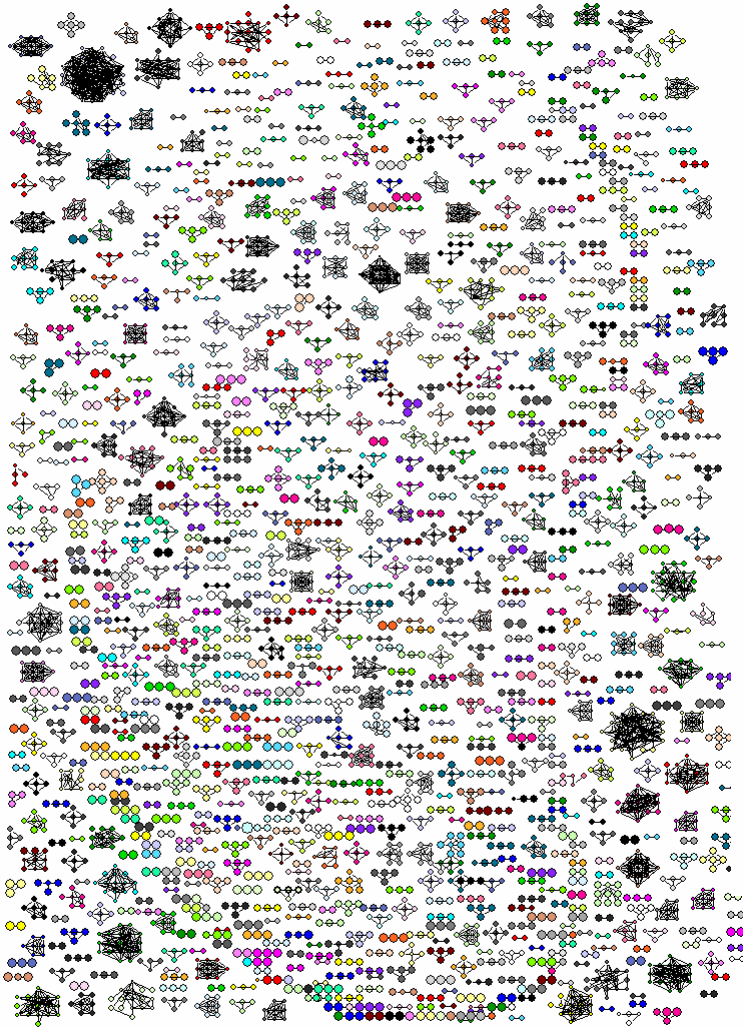
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Volumes of Climate Change 2001.

Motivation

- Explore team collaborations on a global research effort to understand climate change
- Identify relevant influence metrics
- Use metrics to identify key players
- Extract key relationships from citation Network
- Test hypothesis of IPCC social network formation

Analysis of the Entire IPCC Report

Entire Network



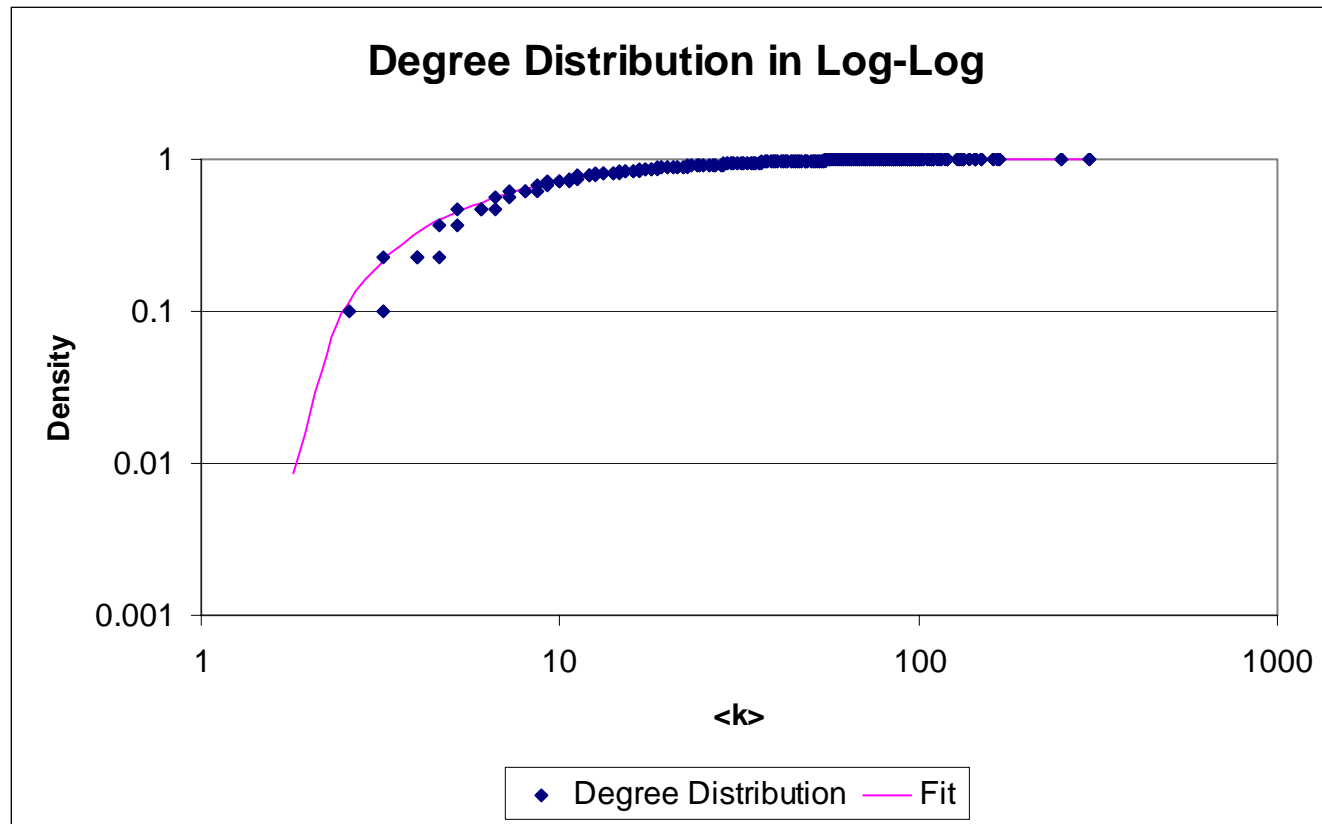
- # of authors: 17901
- # of edges: 71341
- $\langle k \rangle$: 3.98

Cluster Coefficients

	Cluster Coeff. (Pajek CC1)	Biology (Newman, 2001)	Physics (Newman, 2001)
Result	0.022191	0.066	0.414

- Not highly clustered
- Lower clustering than other co-authorship studies
- Note: Most likely different equations, so might not be directly comparable

Power Law Check



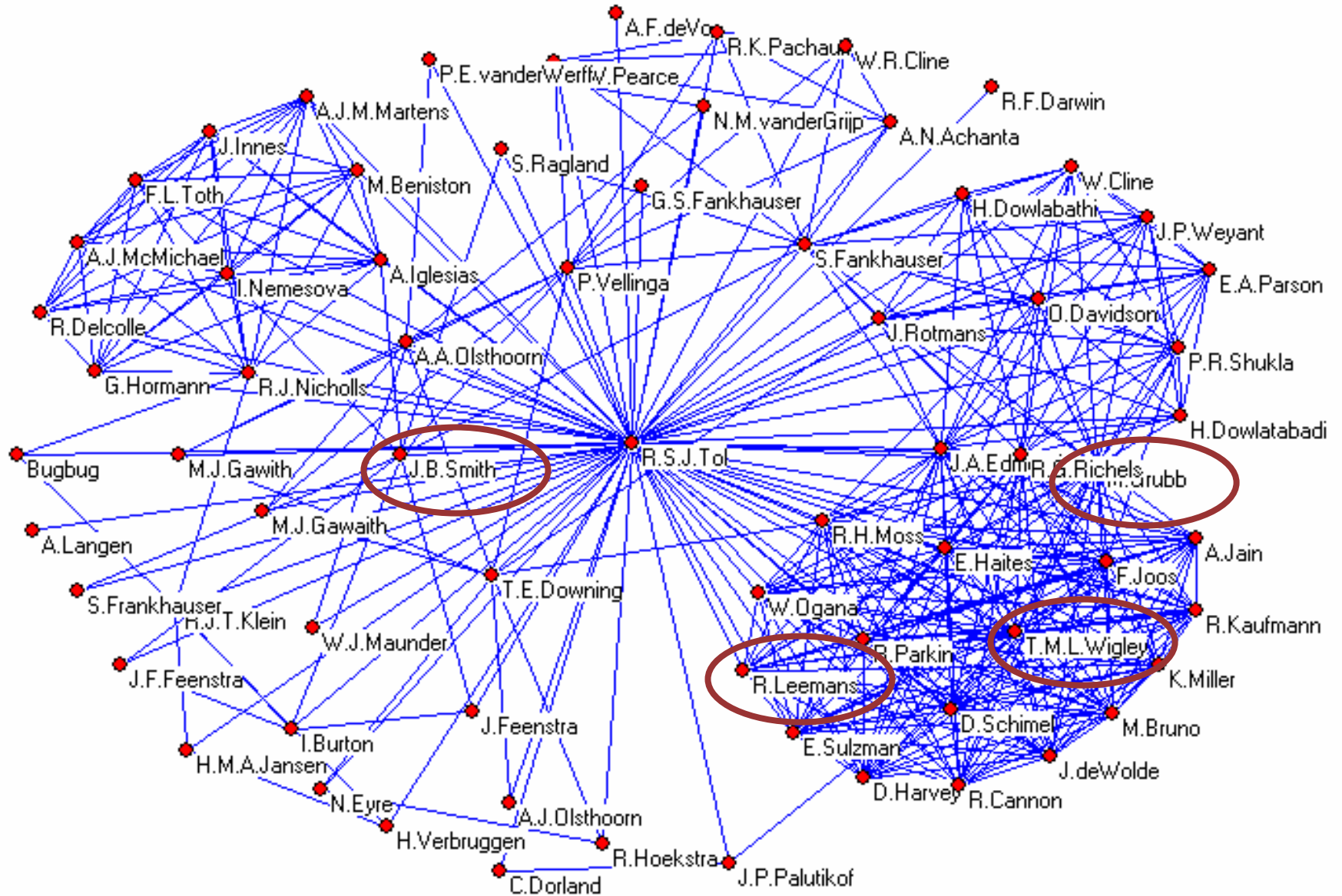
- Possible reason: Restricted set of papers

Top 20 Table

Author	Centrality Betweenness	PhD	Year	Discipline	Affiliation 1	Affiliation 2
T.M.L.Wigley	0.02930	U of Adelaide	1967	Physics	U of Waterloo	U of East Anglia
R.Leemans	0.01589	Uppsala University		Ecology	Wageningen U	UK AEA
C.Rosenzweig	0.01510	U of Massachusetts	1991	Environmental Science	NASA	RIVM
J.F.B.Mitchell	0.01465	Belfast	1973	Physics	Hadley Centre	
J.E.Penner	0.01402	Harvard	1977	Mathematics	LLNI	UCAR
I.C.Prentice	0.01373	Cambridge	1977	Environmental Science	U of Bristol	U of Michigan
P.D.Jones	0.01132	U of Newcastle	1977	Environmental Science	U of East Anglia	
M.E.Schlesinger	0.01089	UCLA	1976	Atmospheric Science	U of Illinois U-C	
J.A.Patz	0.01081	Case Western	1987	Molecular Biology	Johns Hopkins	IPCC
M.Heimann	0.01068	U of Bern	1982	Biogeochemistry	Max Planck Institut	U of Wisconsin
F.S.Chapin	0.01035	Stanford	1973	Biology	U of Alaska	IPCC
A.HendersonSelle	0.00989			Atmospheric Science	Honored with Aus	NAS
R.S.J.Tol	0.00882	Vrije	1997	Economics	Energy Economic	ANSTO
M.Hulme	0.00855	U of Wales	1985		U of East Anglia	Carnegie Mellon
S.H.Schneider	0.00787	Columbia	1971	Physics	Stanford	Tyndall Centre
K.P.Shine	0.00770			Meteorology	U of Reading	MacArthur
Y.Zhang	0.00769	U of Washington	1996	Atmospheric Science		IPCC
G.Marland	0.00755	U of Minnesota	1972	Geology	Indiana State U	IPCC
F.Giorgi	0.00749	Georgia Tech	1986	Physics	NCAR	Oak Ridge National
W.H.Schlesinger	0.00706	Cornell	1976	Biology	Duke	ENER (Italy)
S.Brown	0.00700			Biogeochemistry	Hadley Centre	
M.Weber	0.00691				Technical U Muni	UK AEA
D.Rind	0.00638	Columbia	1976	GCM	Earth Institute	Columbia
J.B.Smith	0.00626	M.S. Public Policy	1982	Economics	EPA	Stratus Consulting

R.S.J.Tol Neighborhood

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Photo of Dr. R.S.J. Tol.



How MIT Ranks

Author	Centrality Betweenness	Rank	PhD	Year	Discipline	Affiliation 1
R.Prinn	0.00047097	875	MIT	1971	Atmospheric Scienc	MIT
H.D.Jacoby	0.00032858	1196	Harvard	1967	Economics	MIT
M.Grubb	0.00540247	39	Imperial College	1985*	Economics	U of Cambridge

- Prof. Jacoby thought that MIT might not be represented b/c:
 - WGIII (vol 3) didn't examine MIT's models (more political).
 - MIT chooses not to be dragged into the fray.
 - Our models are used by others.



- Longest Path

- 19 edges
- 20 authors

Details of Long Path

	Author	Full Name	Nationality	PhD	Field/Year	Discipline	Affiliation 1
1	B.Aniansson	Britt Aniansson	Swedish*			Negotiations	Swedish Council for
2	U.Svedin	Uno Svedin	Swedish*			Negotiations	Swedish Council for
3	C.Folke	Carl Folke	Swedish*			Economics	Royal Swedish Aca
4	M.Gadgil	Madhav Gadgil	Indian	Harvard	Biology*/1969	Ecology	Indian Institute of Sc
5	J.A.McNeely	Jeffery McNeely	US	UCLA	Anthropology/196X	Biodiversity	IUCN
6	W.V.Reid	Walter Reid	US	U of Washinton	Zoology/1987	Biodiversity	Director of the Miller
7	J.Goldemberg	Jose Goldemberg	Brazilian	U of Sao Paulo	Physics	Energy	Instituto de Eletrotec
8	J.R.Moreira	Jose R. Moreira	Brazilian	U of Sao Paulo	Physics		Instituto de Eletrotec
9	G.Marland			U of Minnesota	Geology/1972	Geology	Indiana State Unive
10	I.Fung	Inez Fung		MIT	Meteorology/1977	Atmospheric Science	UC Berkeley
11	P.A.Matson	Pamela A. Matson	US*	Oregon State	Ecology/1983	Earth Science	UC Berkeley
12	W.H.Schlesinger			Cornell		Biology	Duke
13	S.A.Prior	Stephen A. Prior	US*	Auburn	Agronomy/1993	Earth Science	National Soil Dynam
14	B.A.Kimball	Bruce A. Kimball	US*	Colorado State	Ecology/1997		USDA
15	M.Johnson	Mark Johnson	US*	Cornell	Soil Chemistry/1986	Earth Science	EPA
16	J.King	John W. King	US*	U of Minnesota	Geology/1983	Oceanography	University of Rhode
17	D.J.Noakes	David L. G. Noakes	Canadian*	UC Berkeley	Zoology/1971	Zoology	University of Guelph
18	V.V.Ivanov	Vladimir Ivanov	Russian*	St. Petersburg	Oceanography/1992	Oceanography	University of Plymou
19	A.P.Nagurnyi	Andrei P. Nagurnyi	Russian*			(arctic fish/ocean)	AARI
20	P.A.Abaza					(arctic fish/ocean)	

Analysis of IPCC Volumes

3 Volumes

V1: Scientific Basis – pure science

V2: Impacts, Adaptation and Vulnerability
- science (50%) + policy & economics (50%)

V3: Mitigation – science (20%) + policy & economics (80%)

	# of authors	# of papers	m
V1	7024	4650	40491
V2	10072	6841	30546
V3	3481	2846	7191

Hypothesis 1

H: Each field has a different structure in the collaboration network.

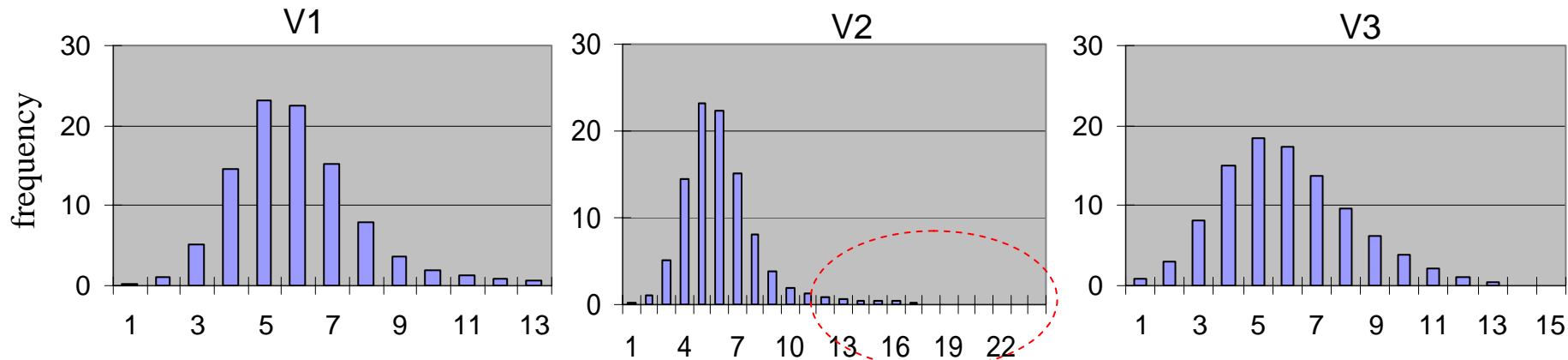
1) Collaboration statistics

	$\langle k \rangle$	# papers of single author	# of authors per paper
V1	5.76	209 (2.97%)	3.78
V2	3.03	1069 (10.61%)	2.83
V3	2.07	669 (19.22%)	2.23

➡ Scientists tend to collaborate more than social scientists.

Hypothesis 1

2) Distance and Cluster



	Average Path Lengths	Unreachable pairs (%)	Longest Path Lengths	Largest Cluster
V1	4.85	34.50	13	80.92 %
V2	6.09	74.45	24	50.49 %
V3	5.98	86.96	15	36.02 %

➡ Many of social scientists tend to have own individual research group and do not collaborate with other research groups.

Hypothesis 1

3) Centrality

	Betweenness	Degree	Closeness
V1	0.045	0.023	0.237
V2	0.024	0.009	0.167
V3	0.028	0.014	0.143

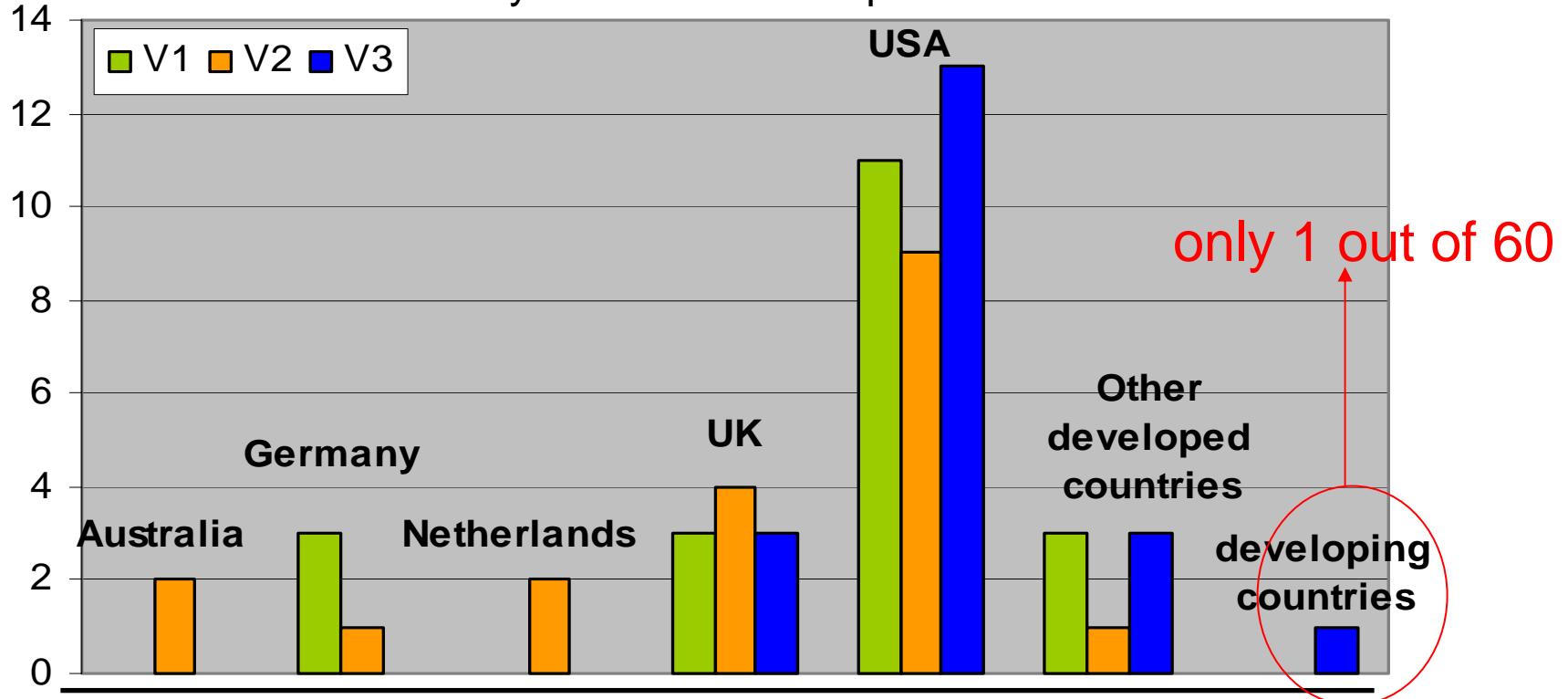
➡ Scientists' collaboration network is the most centralized.

Hypothesis 2

H: There might exist political influence in selection of journal articles in IPCC report.

1) Nationality

Nationality distribution of Top 20 authors



Hypothesis 2

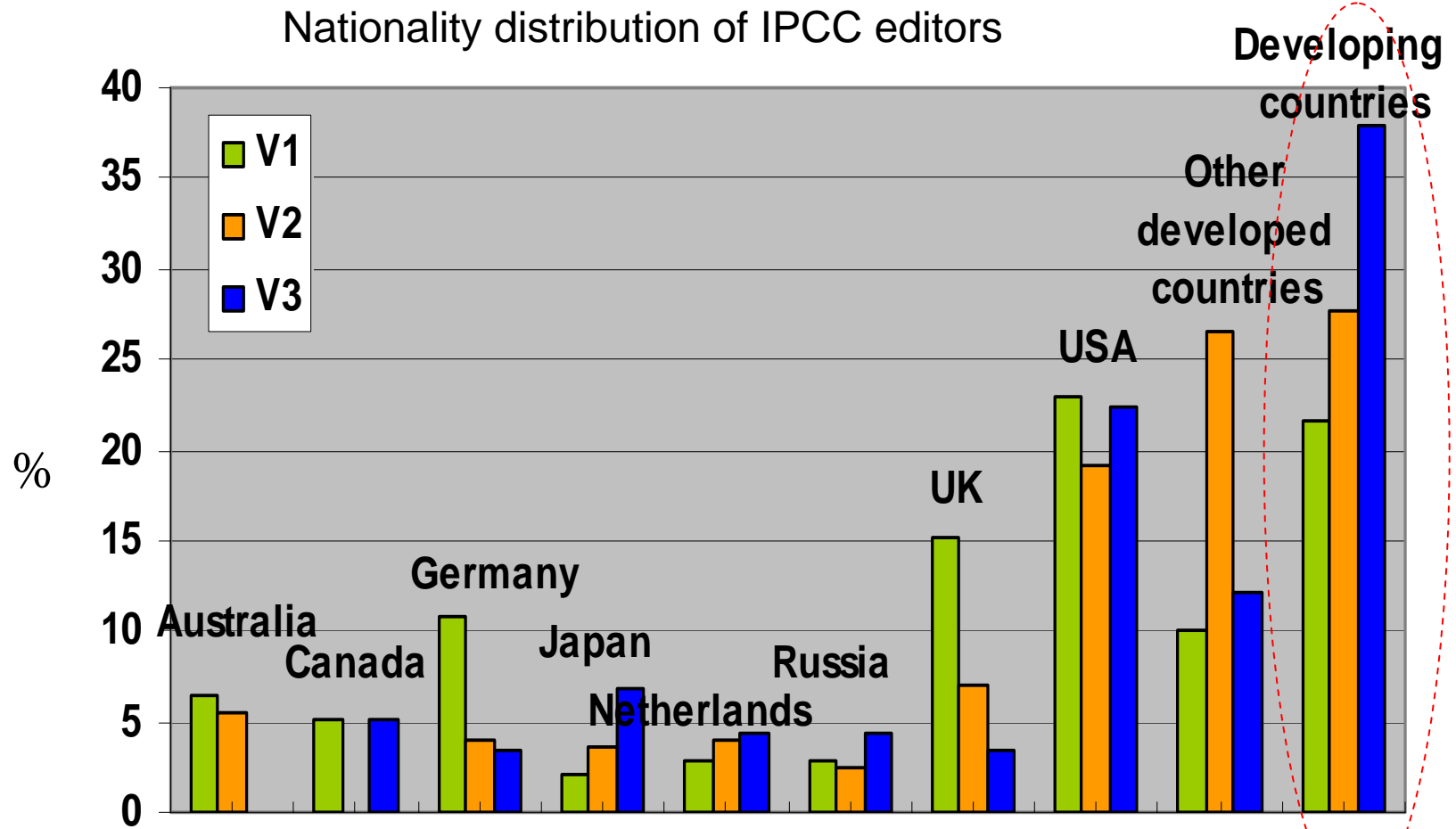
2) IPCC Editors

	# of editors	# of editors in top 20	# of editors in top 50
V1	139	9 (6.5%)	18 (12.9%)
V2	199	9 (4.5%)	19 (9.5%)
V3	116	11 (9.5%)	23 (19.8%)

➡ Editors have a great influence in the V3.

Hypothesis 2

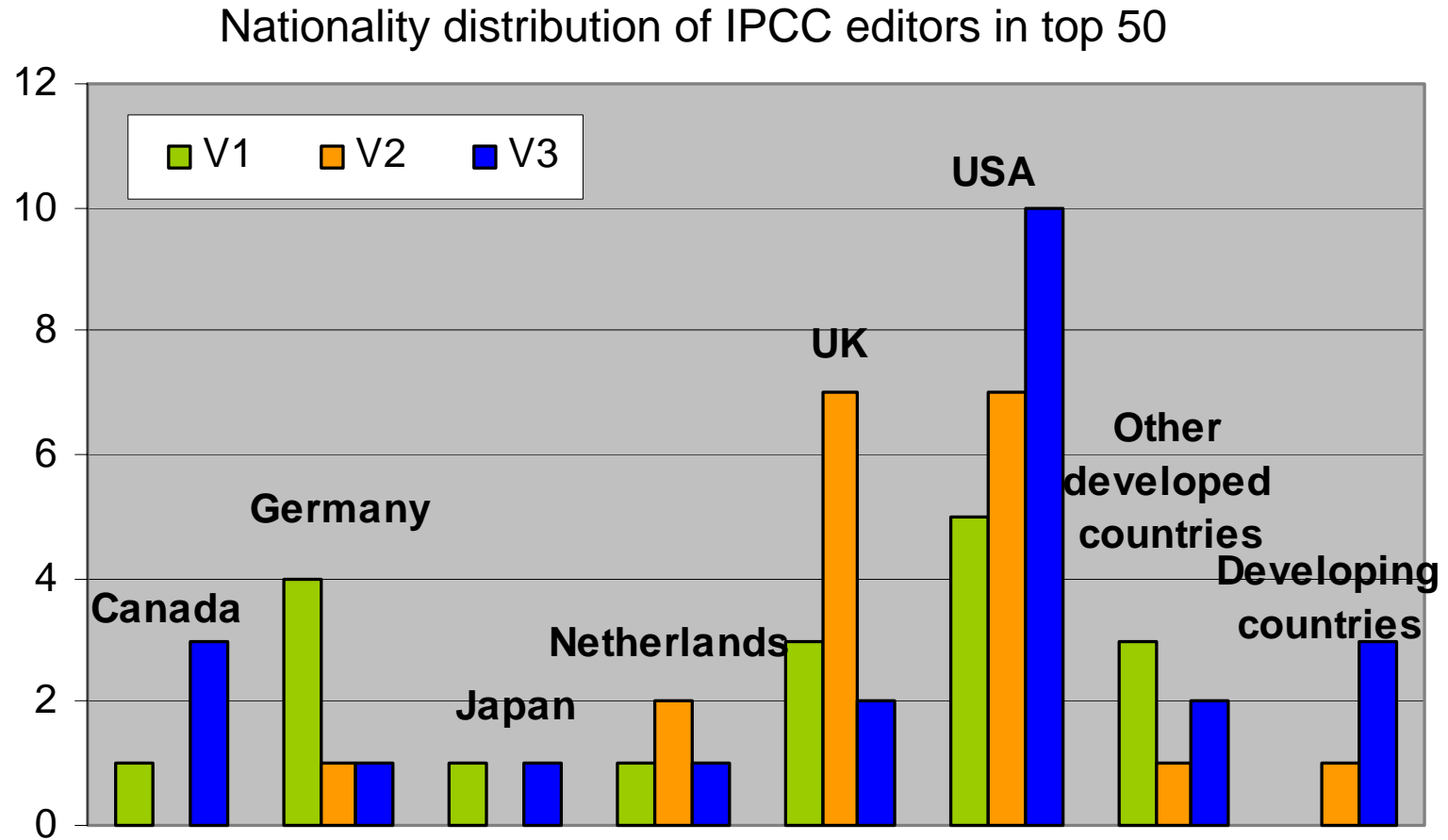
2) IPCC Editors



This looks like we have enough researchers from developing countries

Hypothesis 2

2) IPCC Editors



➡ Editors who have a big influence on the network are mostly from USA and UK.

Lessons for International Research Projects

Lessons

- Climate change is a science-based problem
 - Most Top 20 Authors were senior scientists/researchers
- Climate change is a cross-cutting challenge, yet little integrated research
 - Most collaborations were scientist-only
 - Efforts should be made to increase collaborations among ecologists, economists, scientists, and policy-makers
- “Affirmative action” for developing country researchers to offset capacity issues
 - Associate them with the most “central” researchers

- Thank you.
- Questions?

J.B. Smith Neighborhood

