Stability in human interaction networks: primitive typology of vertex, prominence of measures and time activity statistics, SUPPORTING INFORMATION

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This is the supporting information of the article that reports interaction networks stability by means of three quantitative criteria: activity distribution in time and among participants; a sound classification of vertices in peripheral, intermediary and hub sectors; the combination of basic measures into principal components with greater variance.

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These results were produced with the Gmane public domain data and an open python package designed for attaining these, and related, results. The interested reader should follow Appendix A to access both data and rotines. Inline are results for 4 emails lists: LAD, LAU, MET and CPP, as described in Section II. Similar results can be reproduced for any number of (Gmane) email lists. To avoid repeating text of each table for each list, the text is given inline.

I. TIME TABLES IN DIFFERENT SCALES

Theory presented in Section III A and results exposed in Section IV A of the paper[1].

A. Time circular measures

The rescaled circular mean θ'_μ, the standard deviation $S(z)$, the variance $Var(z)$, the circular dispersion $\delta(z)$ and the relation of maximum and minimum incidence at each time unit $\frac{max(incidence}{min(incidence}$. Also, $\mu_{\frac{max(incidence')}{min(incidence')}}$ and $\sigma_{\frac{max(incidence')}{min(incidence')}}$ are given for 1000 uniform distribution simulations within the same number of bins and with the same number of samples. Section III A describes the theoretical background of directional (or circular) statistics.

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TABLE I. LAU circular measures

scale	θ'_μ	$S(z)$	$Var(z)$	$\delta(z)$	$\frac{max(incidence)}{min(incidence)}$	$\mu_{\frac{max(incidence')}{min(incidence')}}$	$\sigma_{\frac{max(incidence')}{min(incidence')}}$
seconds	$-//-$	3.31	1.00	29337.65	1.27	1.29	0.04
minutes	$-//-$	3.13	0.99	8879.19	1.32	1.29	0.04
hours	-8.76	1.56	0.71	4.92	8.38	1.14	0.03
weekdays	-0.21	2.14	0.90	45.41	1.62	1.05	0.02
month days	-0.64	2.76	0.98	1001.75	1.49	1.17	0.03
months	3.55	2.30	0.93	94.53	1.57	1.09	0.02

TABLE II. LAD circular measures

scale	θ'_μ	$S(z)$	$Var(z)$	$\delta(z)$	$\frac{max(incidence)}{min(incidence)}$	$\mu_{\frac{max(incidence')}{min(incidence')}}$	$\sigma_{\frac{max(incidence')}{min(incidence')}}$
seconds	$-//-$	3.13	0.99	9070.17	1.28	1.29	0.05
minutes	$-//-$	3.60	1.00	205489.40	1.22	1.29	0.05
hours	-9.61	1.52	0.68	4.36	9.77	1.14	0.03
weekdays	-0.03	2.03	0.87	29.28	1.72	1.05	0.02
month days	-2.65	2.93	0.99	2657.77	1.50	1.17	0.03
months	-0.56	2.14	0.90	44.00	2.25	1.09	0.02

TABLE III. MET circular measures

scale	θ'_μ	$S(z)$	$Var(z)$	$\delta(z)$	$\frac{max(incidence)}{min(incidence)}$	$\mu_{\frac{max(incidence')}{min(incidence')}}$	$\sigma_{\frac{max(incidence')}{min(incidence')}}$
seconds	$-//-$	3.06	0.99	5910.47	1.27	1.29	0.04
minutes	$-//-$	3.14	0.99	9696.29	1.34	1.29	0.04
hours	-9.20	1.35	0.60	2.76	19.26	1.14	0.03
weekdays	-0.27	1.86	0.82	13.82	2.89	1.05	0.02
month days	3.58	2.49	0.95	237.30	1.55	1.17	0.03
months	-2.92	1.73	0.78	9.20	3.04	1.09	0.02

TABLE IV. CPP circular measures

scale	θ'_μ	$S(z)$	$Var(z)$	$\delta(z)$	$\frac{max(incidence)}{min(incidence)}$	$\mu_{\frac{max(incidence')}{min(incidence')}}$	$\sigma_{\frac{max(incidence')}{min(incidence')}}$
seconds	$-//-$	3.31	1.00	28205.46	1.26	1.29	0.04
minutes	$-//-$	3.18	0.99	12275.59	1.27	1.29	0.04
hours	-9.39	1.48	0.67	3.91	11.18	1.15	0.03
weekdays	-0.17	1.83	0.81	12.66	2.59	1.05	0.02
month days	-10.12	3.16	0.99	10789.17	1.54	1.17	0.03
months	0.15	2.34	0.93	115.49	1.50	1.08	0.02

B. Time histograms

C. Histograms of activity along the hours of the day

Activity percentages along the hours of the day. Higher activity was observed between noon and 6pm, followed by the time period between 6pm and midnight. Around 2/3 of the whole activity takes place from noon to midnight. Nevertheless, the activity peak occurs around midday, with a slight skew toward one hour before noon.

TABLE V. LAU activity along the hours of the day

	1h	2h	3h	4h	6h	12h
0h	3.58	5.80	7.43	8.49	10.14	36.88
1h	2.22					
2h	1.63	2.69				
3h	1.06		2.72	5.20		
4h	0.84	1.66				
5h	0.82					
6h	1.17	3.54	7.07		26.74	
7h	2.37					
8h	3.53	9.57		23.20		
9h	6.04		19.67			
10h	6.83	13.62				
11h	6.79					
12h	6.11	12.36	18.75	24.68	35.66	63.12
13h	6.26					
14h	6.38	12.31				
15h	5.93		16.91	20.73		
16h	5.52	10.98				
17h	5.46					
18h	5.23	9.75	14.30		27.46	
19h	4.52			17.71		
20h	4.55	8.97				
21h	4.42		13.16			
22h	4.51	8.74				
23h	4.23					

TABLE VI. LAD activity along the hours of the day

	1h	2h	3h	4h	6h	12h
0h	4.01	6.53	8.32	9.37	10.78	33.11
1h	2.52					
2h	1.79	2.84				
3h	1.06		2.46	3.81		
4h	0.75	1.40				
5h	0.66				22.33	
6h	0.85	2.41	5.36			
7h	1.56					
8h	2.95	7.61		19.93		
9h	4.66		16.98			
10h	5.92	12.32				
11h	6.40					
12h	6.41	12.53	18.85	24.82	37.24	66.89
13h	6.12					
14h	6.32	12.29				
15h	5.97		18.39	23.44		
16h	6.40	12.42				
17h	6.02				29.65	
18h	5.99	11.02	15.65			
19h	5.03			18.63		
20h	4.63	9.22				
21h	4.59		14.00			
22h	4.88	9.41				
23h	4.53					

TABLE VII. MET activity along the hours of the day

	1h	2h	3h	4h	6h	12h
0h	2.87	4.64	5.67	6.31	7.15	29.33
1h	1.77					
2h	1.04	1.67				
3h	0.64		1.48	2.89		
4h	0.47	0.85				
5h	0.38				22.18	
6h	0.72	2.04	4.71			
7h	1.33					
8h	2.67	7.07		20.14		
9h	4.40		17.47			
10h	6.29	13.07				
11h	6.78					
12h	7.33	14.41	21.50	28.65	42.22	70.67
13h	7.08					
14h	7.09	14.24				
15h	7.14		20.72	24.79		
16h	6.68	13.58				
17h	6.89				28.44	
18h	5.99	11.22	16.19			
19h	5.23			17.22		
20h	4.98	9.34				
21h	4.37		12.25			
22h	4.24	7.88				
23h	3.64					

TABLE VIII. CPP activity along the hours of the day

<table>
<tr><th></th><th>1h</th><th>2h</th><th>3h</th><th>4h</th><th>6h</th><th>12h</th></tr>
<tr><td>0h</td><td>3.66</td><td rowspan="2">6.42</td><td rowspan="3">8.20</td><td rowspan="4">9.30</td><td rowspan="5">10.67</td><td rowspan="10">33.76</td></tr>
<tr><td>1h</td><td>2.76</td></tr>
<tr><td>2h</td><td>1.79</td><td rowspan="2">2.88</td></tr>
<tr><td>3h</td><td>1.10</td><td rowspan="3">2.47</td></tr>
<tr><td>4h</td><td>0.68</td><td rowspan="2">1.37</td><td rowspan="4">3.44</td></tr>
<tr><td>5h</td><td>0.69</td></tr>
<tr><td>6h</td><td>0.83</td><td rowspan="2">2.07</td><td rowspan="3">4.35</td><td rowspan="5">23.09</td></tr>
<tr><td>7h</td><td>1.24</td></tr>
<tr><td>8h</td><td>2.28</td><td rowspan="2">6.80</td><td rowspan="4">21.03</td></tr>
<tr><td>9h</td><td>4.52</td><td rowspan="3">18.75</td></tr>
<tr><td>10h</td><td>6.62</td><td rowspan="2">14.23</td></tr>
<tr><td>11h</td><td>7.61</td><td rowspan="11">66.24</td></tr>
<tr><td>12h</td><td>6.44</td><td rowspan="2">12.48</td><td rowspan="3">18.95</td><td rowspan="4">25.05</td><td rowspan="5">37.63</td></tr>
<tr><td>13h</td><td>6.04</td></tr>
<tr><td>14h</td><td>6.47</td><td rowspan="2">12.57</td></tr>
<tr><td>15h</td><td>6.10</td><td rowspan="3">18.68</td></tr>
<tr><td>16h</td><td>6.22</td><td rowspan="2">12.58</td><td rowspan="4">23.60</td></tr>
<tr><td>17h</td><td>6.36</td></tr>
<tr><td>18h</td><td>6.01</td><td rowspan="2">11.02</td><td rowspan="3">15.88</td><td rowspan="5">28.61</td></tr>
<tr><td>19h</td><td>5.02</td></tr>
<tr><td>20h</td><td>4.85</td><td rowspan="2">9.23</td><td rowspan="4">17.59</td></tr>
<tr><td>21h</td><td>4.38</td><td rowspan="3">12.73</td></tr>
<tr><td>22h</td><td>4.06</td><td rowspan="2">8.36</td></tr>
<tr><td>23h</td><td>4.30</td></tr>
</table>

D. Histograms of activity along the days of the week

Activity percentages along the days of the week. Higher activity was observed during weekdays, with a decrease of activity on weekends of at least one third and two thirds in extreme cases.

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
LAU	15.71	15.81	15.88	16.43	15.14	10.13	10.91
LAD	14.92	17.75	17.01	15.41	14.21	10.40	10.31
MET	17.53	17.54	16.43	17.06	17.46	7.92	6.06
CPP	17.06	17.43	17.61	17.13	16.30	6.81	7.67

E. Histograms of activity along the days of the month

No significant variation of activity in the days along the month was observed. One cannot point much more than a - probably not statistically relevant - tendency of first and second weeks to be more active. The most important trait seems to be homogeneity.

TABLE IX. LAU activity along the days of the month.

	1 day	5	10	15 days
1	3.36	16.21	33.71	50.82
2	3.43			
3	3.31			
4	3.37			
5	2.75			
6	3.03	17.50		
7	3.93			
8	3.62			
9	3.84			
10	3.09			
11	3.20	17.11	34.02	49.18
12	3.40			
13	3.67			
14	3.71			
15	3.14			
16	3.08	16.91		
17	3.13			
18	3.43			
19	3.61			
20	3.67			
21	3.60	15.43	32.27	
22	3.42			
23	2.80			
24	2.64			
25	2.97			
26	3.06	16.85		
27	2.69			
28	3.79			
29	3.75			
30	3.57			

TABLE X. LAD activity along the days of the month.

	1 day	5	10	15 days
1	3.29	15.77	33.63	50.50
2	3.38			
3	2.85			
4	2.94			
5	3.31			
6	3.60	17.85		
7	2.68			
8	3.78			
9	3.88			
10	3.91			
11	3.22	16.87	33.41	49.50
12	2.79			
13	3.50			
14	3.95			
15	3.40			
16	3.32	16.54		
17	2.95			
18	3.50			
19	3.69			
20	3.07			
21	2.76	15.71	32.96	
22	3.35			
23	3.32			
24	3.15			
25	3.13			
26	3.68	17.25		
27	4.02			
28	3.49			
29	3.34			
30	2.72			

TABLE XI. MET activity along the days of the month.

	1 day	5	10	15 days
1	3.05			
2	3.38			
3	3.62	18.25		
4	4.25			
5	3.94		35.24	
6	3.73			
7	3.17			
8	3.26	16.98		50.96
9	3.56			
10	3.26			
11	3.81			
12	2.91			
13	3.30	15.73		
14	2.75			
15	2.95		31.98	
16	3.36			
17	3.16			
18	3.44	16.25		
19	3.36			
20	2.93			
21	3.20			
22	3.11			
23	3.60	15.79		49.04
24	2.74			
25	3.13		32.78	
26	3.13			
27	3.07			
28	3.61	16.99		
29	3.60			
30	3.57			

TABLE XII. CPP activity along the days of the month.

	1 day	5	10	15 days
1	3.22			
2	3.08			
3	3.19	15.98		
4	3.65			
5	2.84		31.82	
6	3.65			
7	3.53			
8	3.10	15.84		49.62
9	2.49			
10	3.07			
11	3.47			
12	3.26			
13	3.55	17.80		
14	3.84			
15	3.68		34.22	
16	3.74			
17	3.40			
18	3.41	16.42		
19	2.95			
20	2.93			
21	3.15			
22	3.64			
23	3.51	17.13		50.38
24	3.32			
25	3.51		33.96	
26	3.54			
27	3.21			
28	3.40	16.84		
29	3.83			
30	2.86			

F. Histograms of activity along months of the year

Activity percentages of the months along the year from LAD list messages. Activity is concentrated in Jun-Aug for MET and LAD, and in Dec-Mar for CPP, LAU and LAD. These observations fit academic calendars, vacations and end-of-year holidays.

TABLE XIII. LAU activity along the months of the year.

	m.	b.	t.	q.	s.
Jan	10.22	19.56	28.24	35.09	49.16
Fev	9.34				
Mar	8.67	15.53			
Apr	6.86		20.93		
Mai	7.28	14.07		30.36	
Jun	6.80				
Jul	8.97	16.29	24.47		50.84
Ago	7.32				
Set	8.18	16.25		34.55	
Out	8.06		26.36		
Nov	7.64	18.30			
Dez	10.66				

TABLE XIV. LAD activity along the months of the year.

	m.	b.	t.	q.	s.
Jan	11.24	18.51	26.46	36.07	57.96
Fev	7.26				
Mar	7.95	17.56			
Apr	9.61		31.50		
Mai	8.94	21.89		37.56	
Jun	12.95				
Jul	9.03	15.67	22.30		42.04
Ago	6.64				
Set	6.63	12.38		26.37	
Out	5.75		19.74		
Nov	7.61	13.99			
Dez	6.38				

TABLE XV. MET activity along the months of the year.

	m.	b.	t.	q.	s.
Jan	4.87	11.00	16.89	23.30	47.70
Fev	6.13				
Mar	5.89	12.30			
Apr	6.41		30.81		
Mai	10.45	24.40		47.87	
Jun	13.95				
Jul	13.24	23.47	31.21		52.30
Ago	10.22				
Set	7.75	16.79		28.83	
Out	9.04		21.09		
Nov	7.45	12.05			
Dez	4.59				

TABLE XVI. CPP activity along the months of the year.

	m.	b.	t.	q.	s.
Jan	8.70	17.00	27.23	36.49	54.27
Fev	8.29				
Mar	10.23	19.49			
Apr	9.26		27.03		
Mai	9.41	17.78		33.46	
Jun	8.37				
Jul	8.70	15.68	22.94		45.73
Ago	6.98				
Set	7.26	15.36		30.06	
Out	8.10		22.80		
Nov	7.89	14.69			
Dez	6.81				

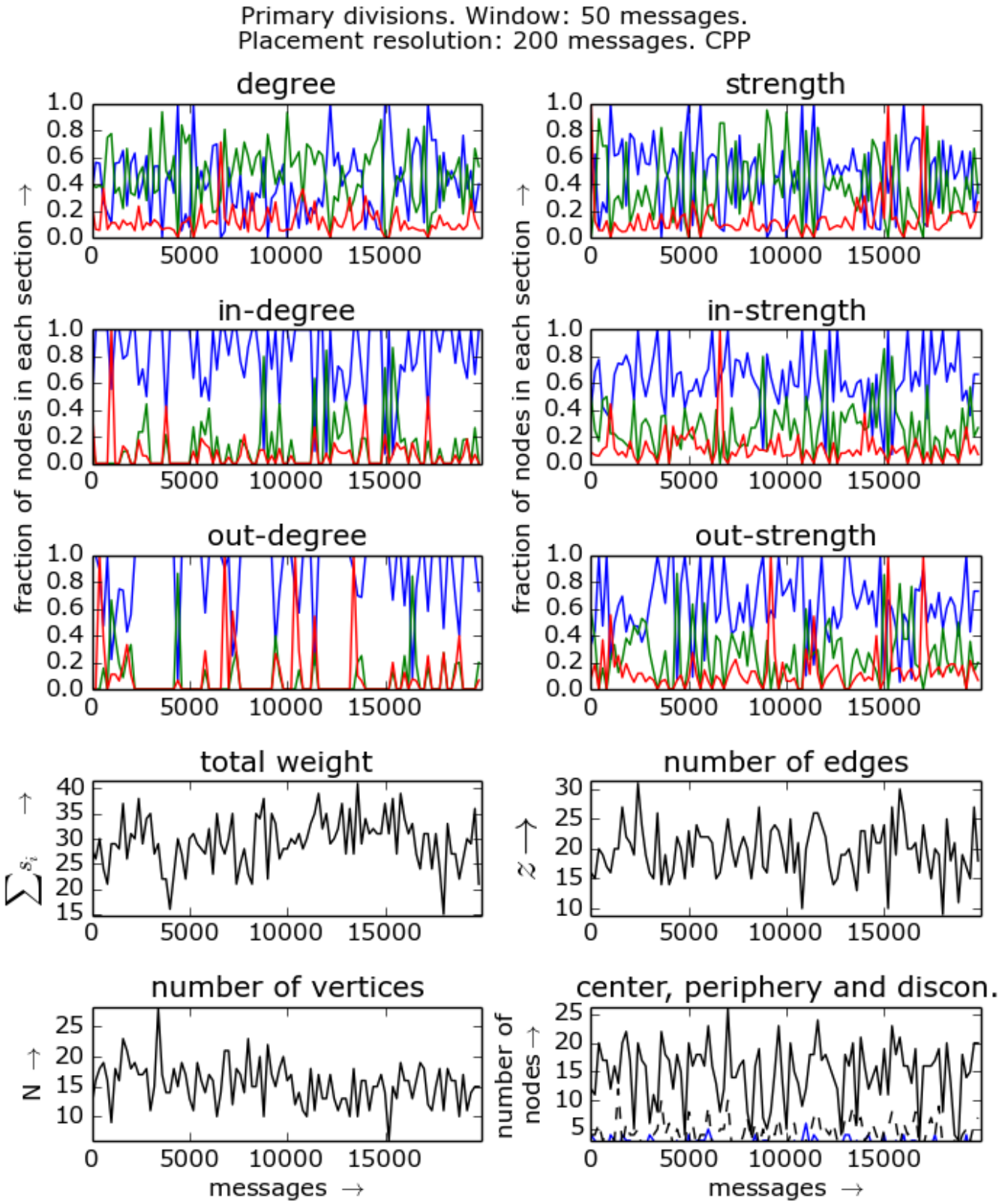
II. FRACTION OF PARTICIPANTS IN EACH ERDÖS SECTOR ALONG THE TIMELINE

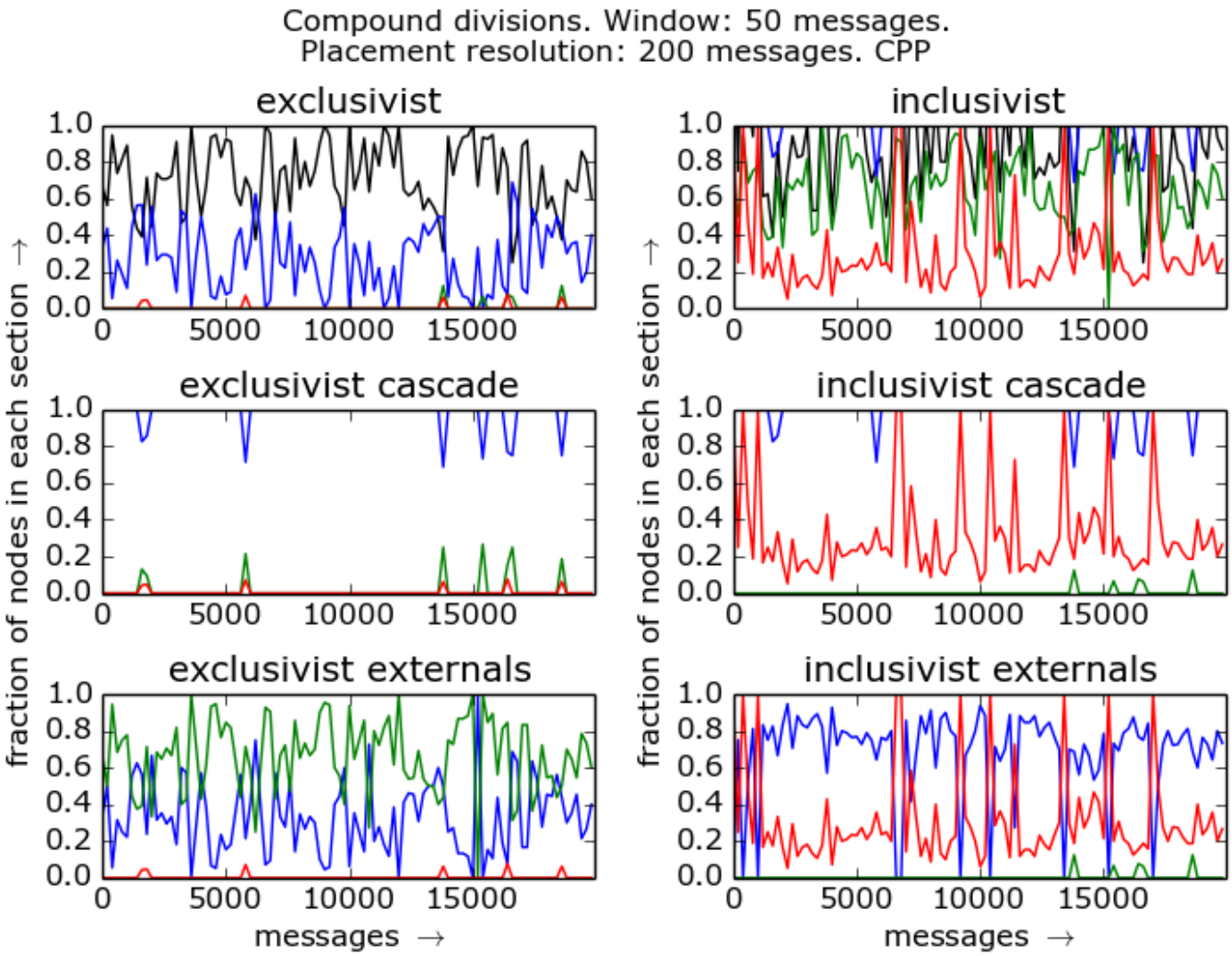
Here we present the fraction of participants in each Erdös sector with respect to each criteria defined in Section III C. Step sizes of 50, 100, 250, 500, 1000 and 5000 are shown bellow, first for CPP, than for LAD list.

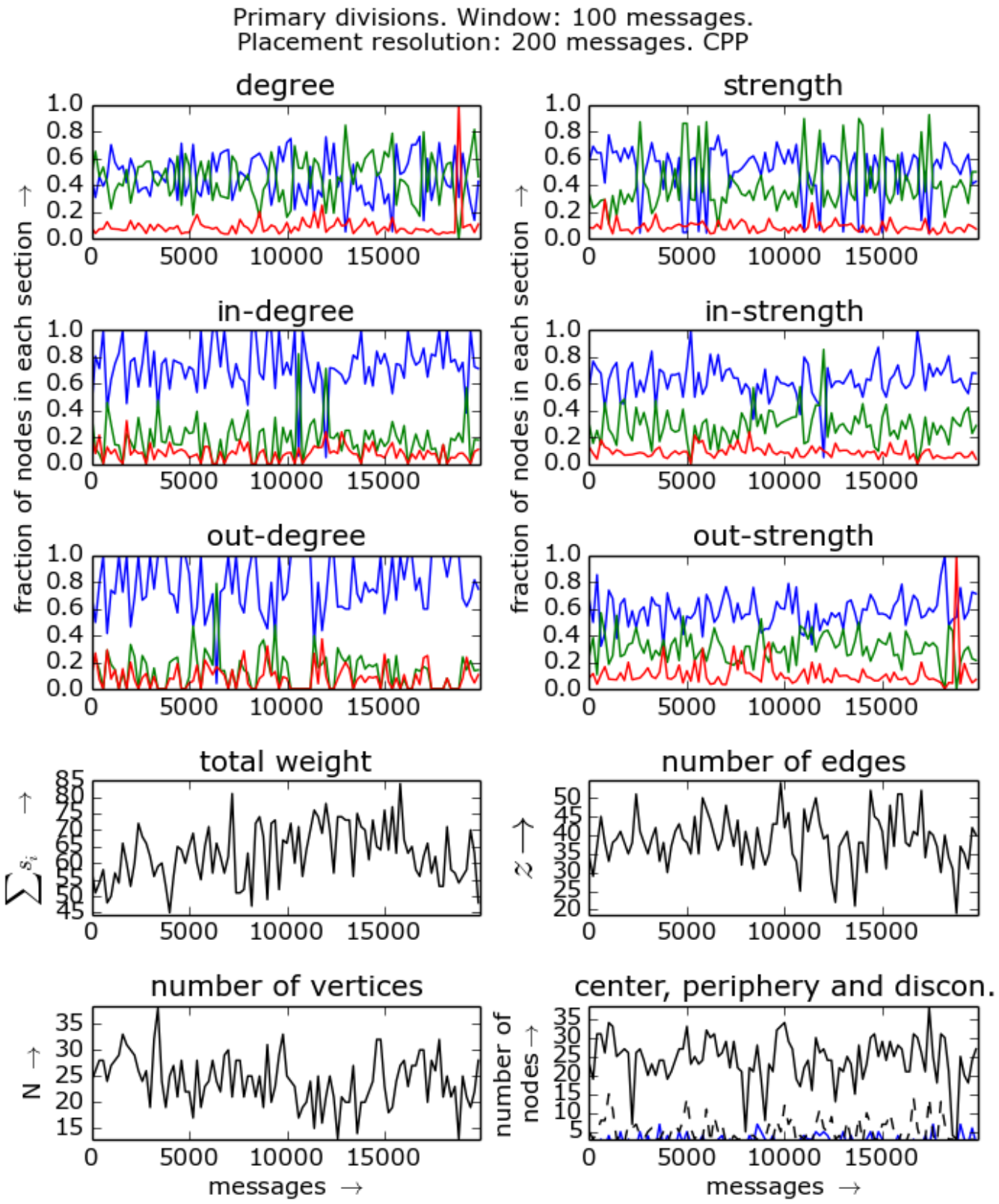
Each step size takes two pages of plot. On the first page, the criteria are each centrality measure observed separately: in and out degrees and strengths. In the first six plots, red is fraction of hubs, green is the fraction of intermediary and blue is for peripheral fraction. On the last plot, red is the center (maximum distance to another vertex is equal to radius), blue is periphery (maximum distance equals to diameter) of the giant component. On the same graph, green counts the disconnected vertices.

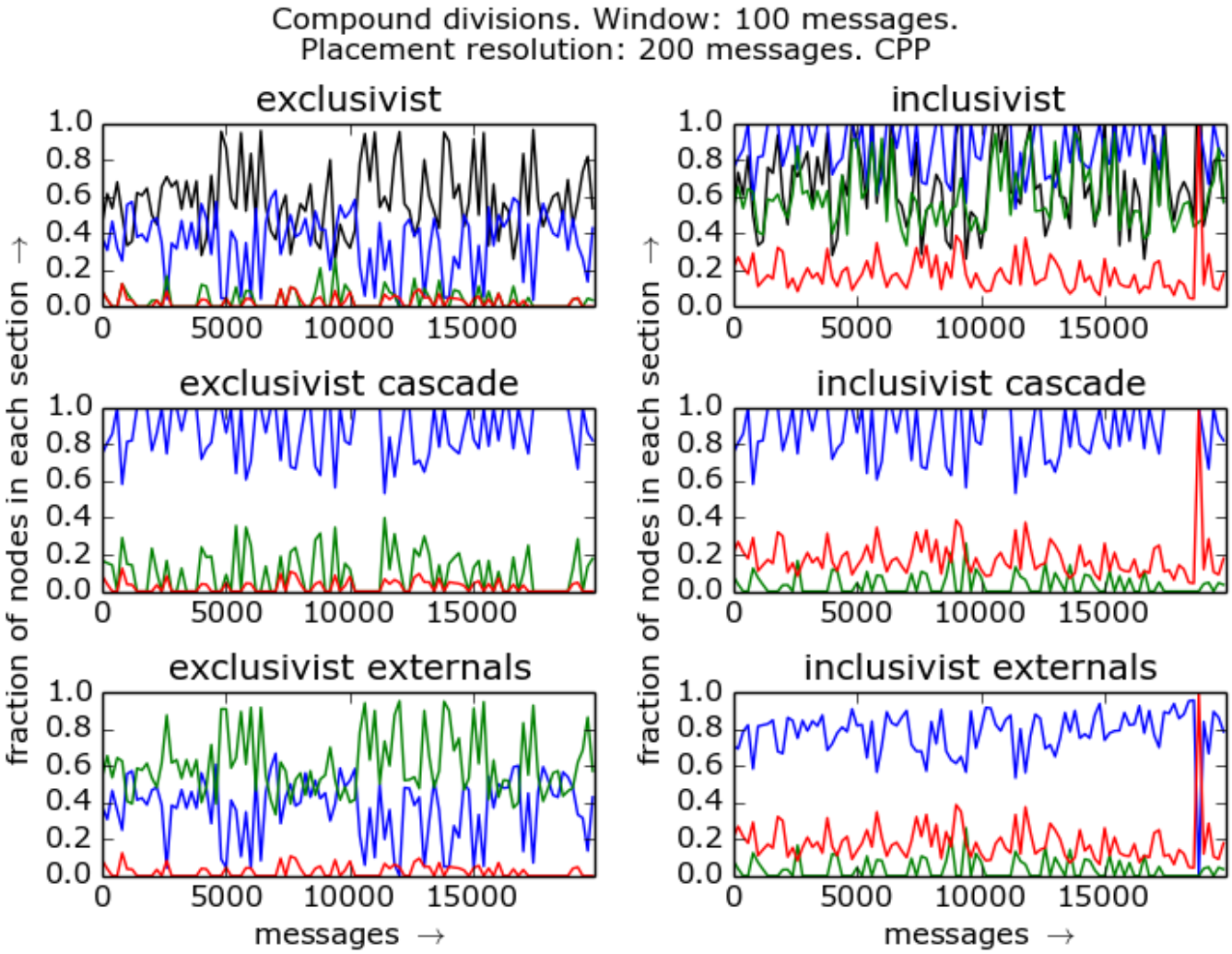
On the second page we show the fractions of participants with respect to each compound criteria for the Erdös sectioning. In the first plot, the fraction of vertices with unique classification is plotted in black: $\frac{\text{number of nodes uniquely classified}}{\text{number of nodes}}$. On the second plot, black represents the exceeding classifications for the given vertices : $\frac{\text{number of classifications} - \text{number of nodes}}{\text{number of nodes}}$.

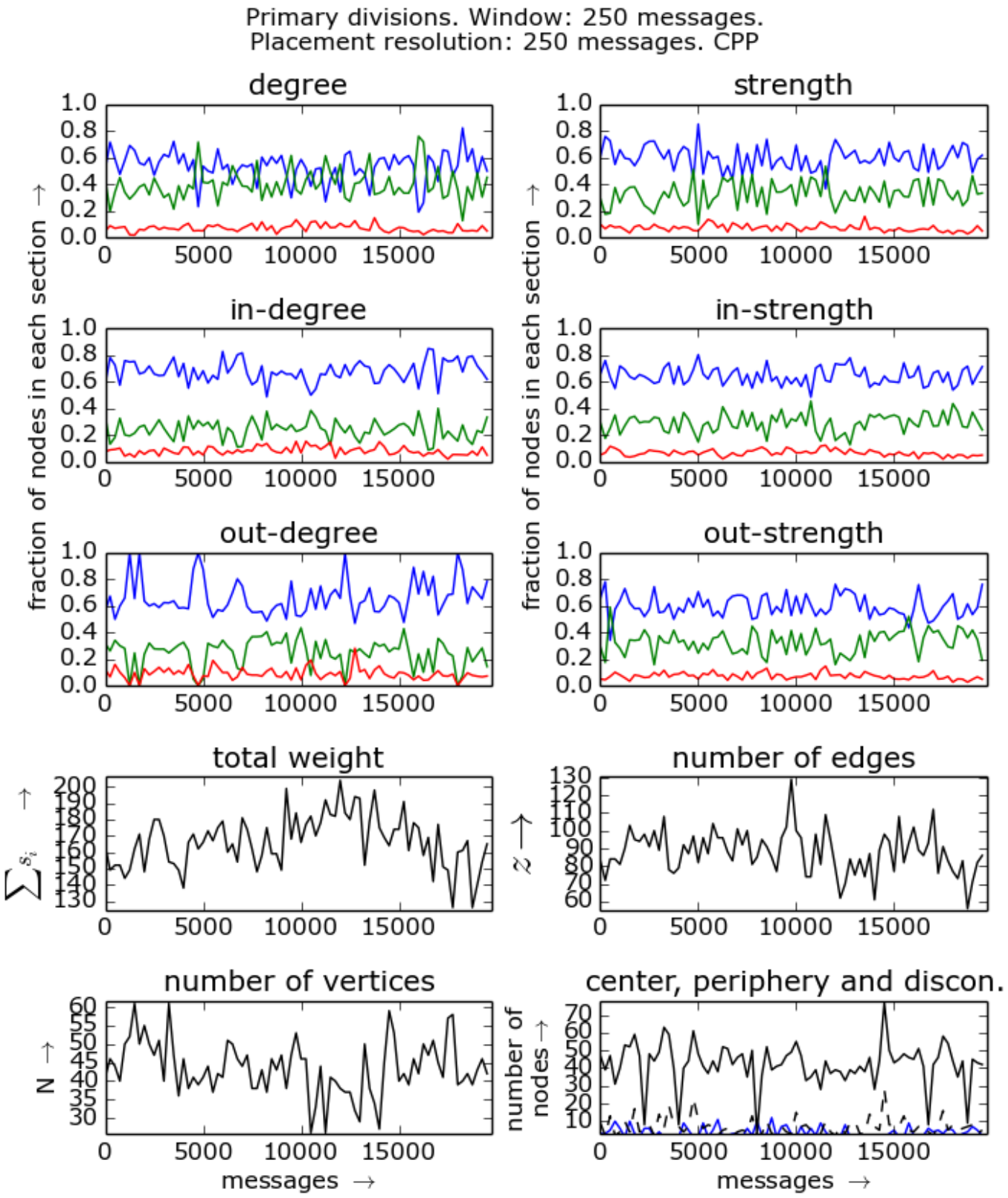
A. CPP list

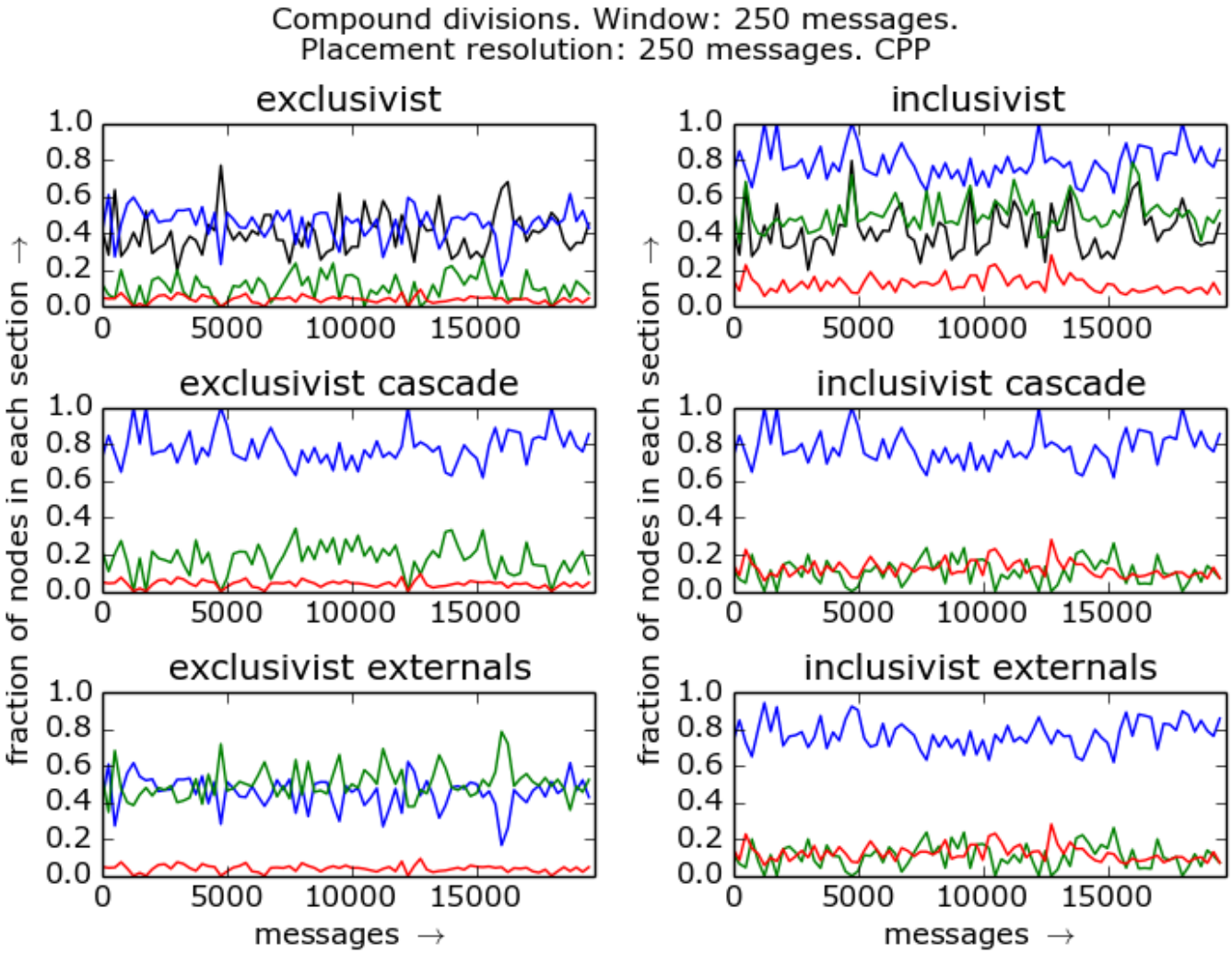

Primary divisions. Window: 50 messages.
Placement resolution: 200 messages. CPP
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →

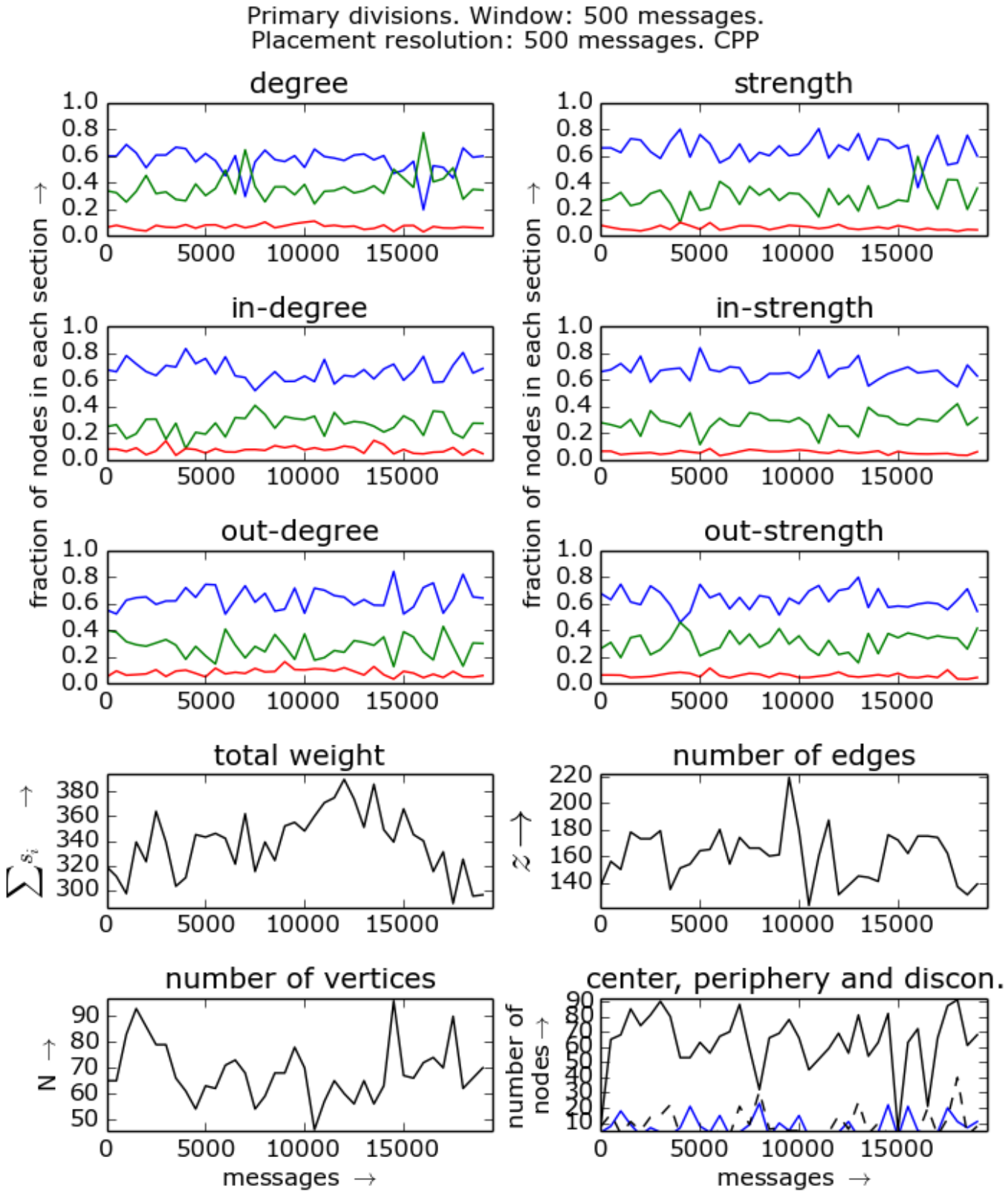

Compound divisions. Window: 50 messages.
Placement resolution: 200 messages. CPP
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000

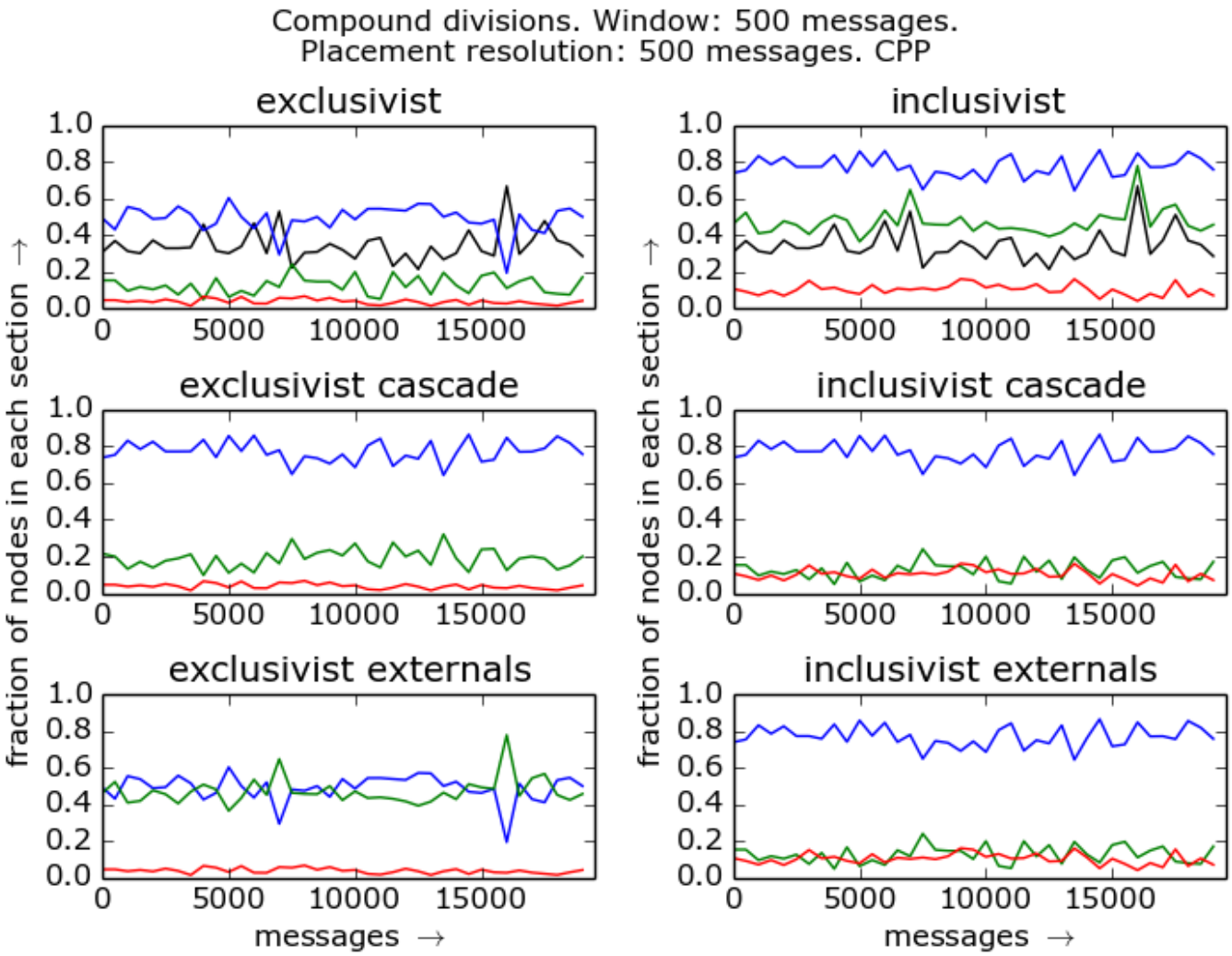

Primary divisions. Window: 100 messages.
Placement resolution: 200 messages. CPP
degree
strength
in-degree
in-strength
out-degree
out-strength
total weight
number of edges
number of vertices
center, periphery and discon.
fraction of nodes in each section →
messages →
N →
number of nodes →

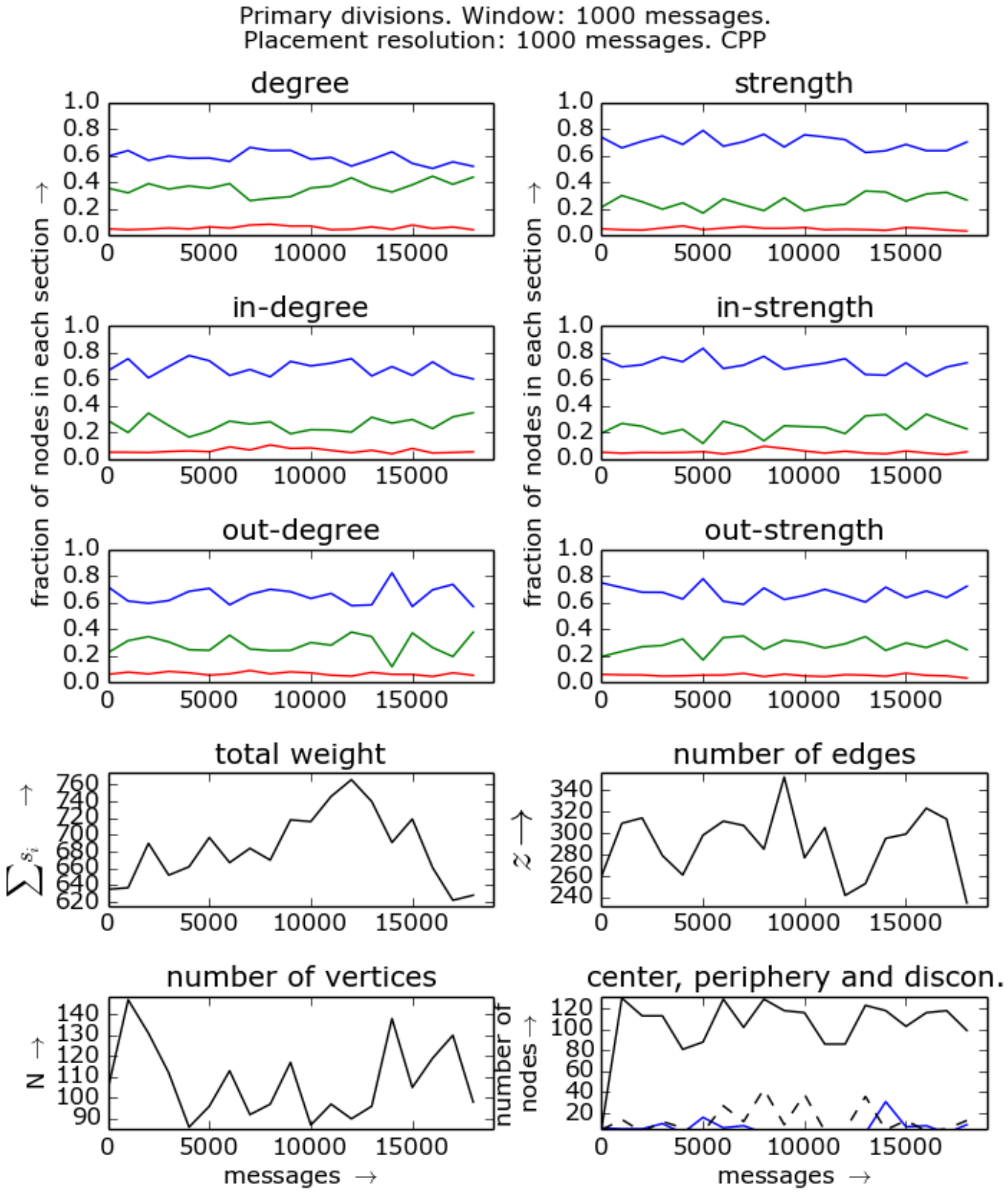

Compound divisions. Window: 100 messages.
Placement resolution: 200 messages. CPP
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000

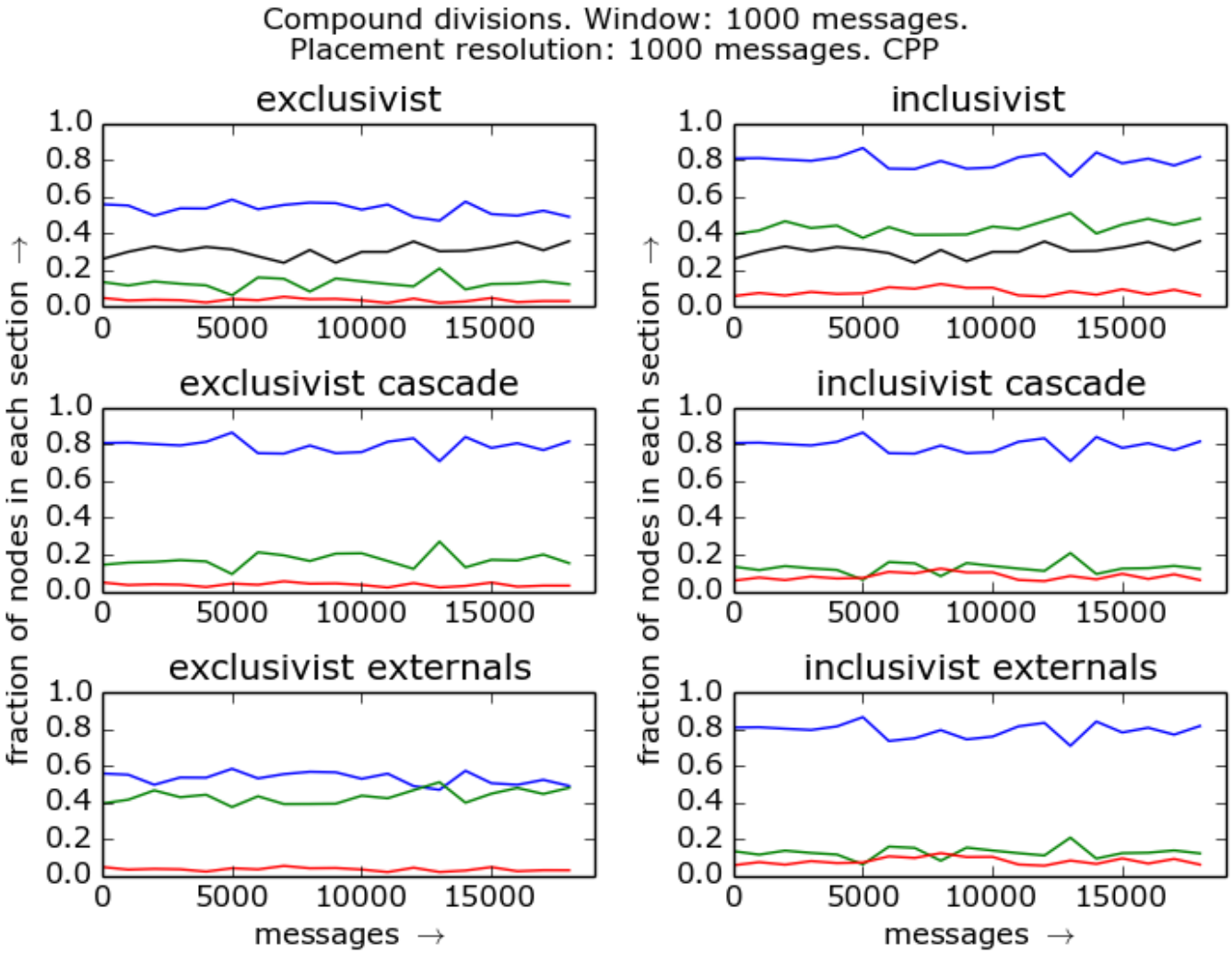

Primary divisions. Window: 250 messages.
Placement resolution: 250 messages. CPP
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →

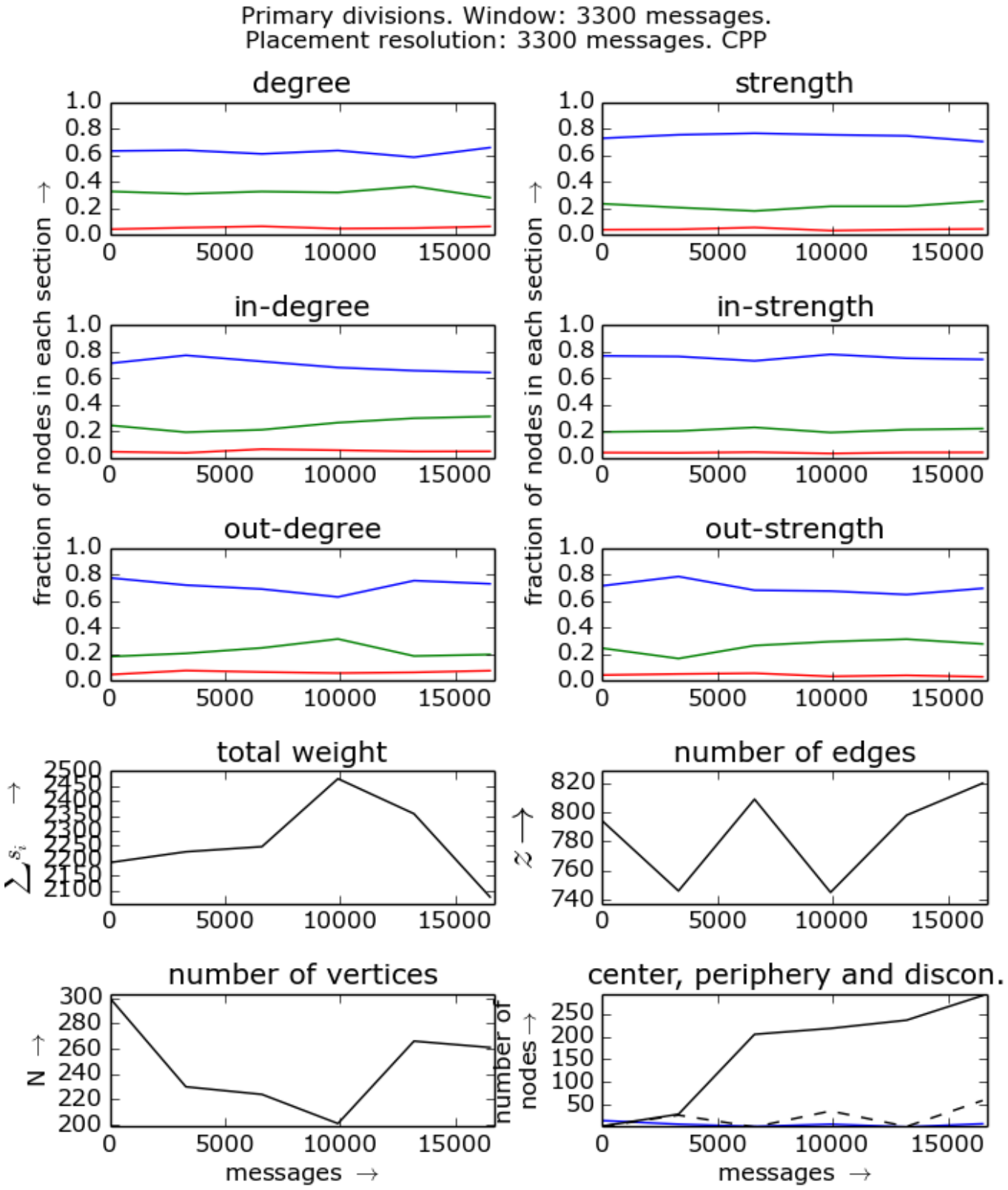

Compound divisions. Window: 250 messages.
Placement resolution: 250 messages. CPP
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000

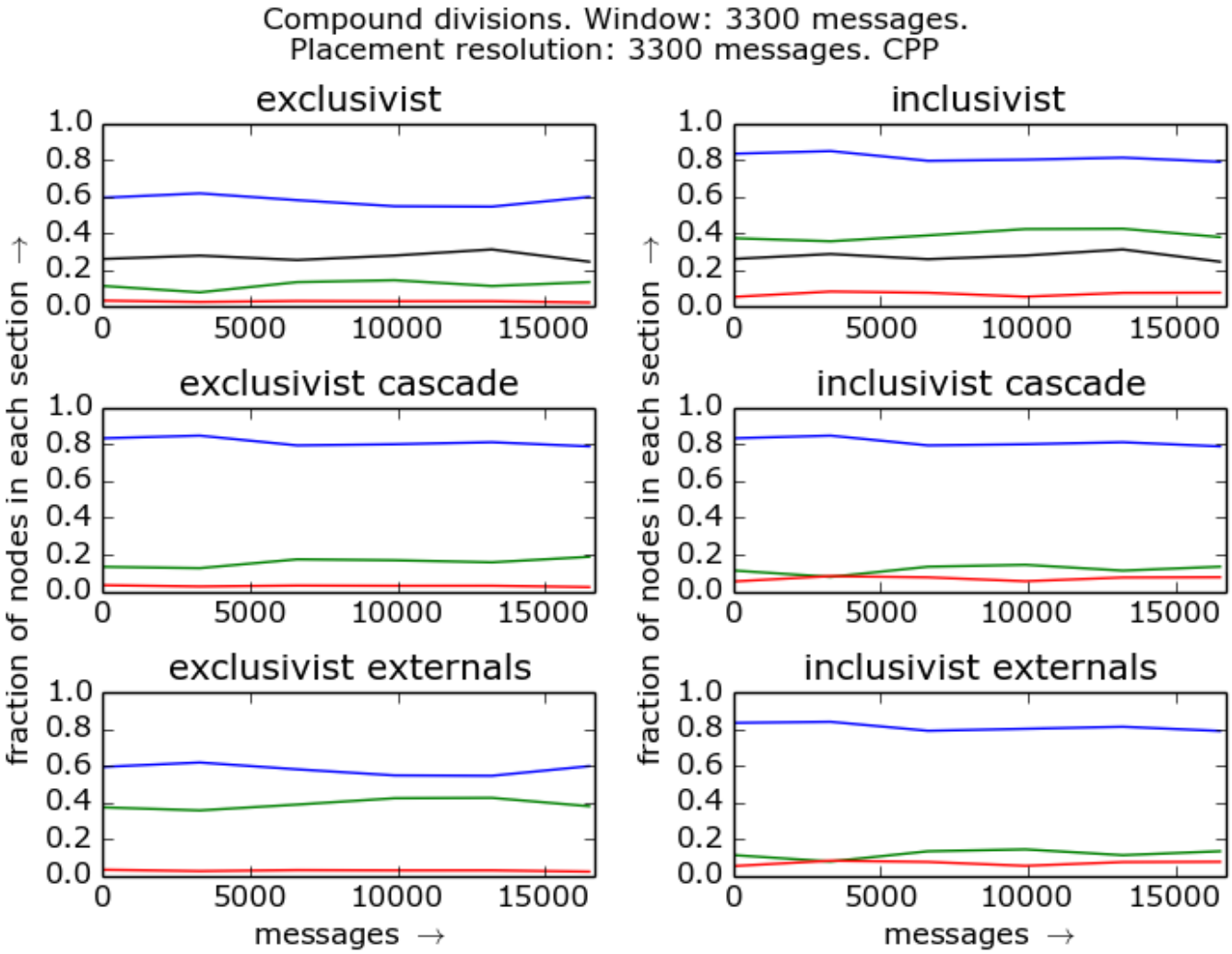

Primary divisions. Window: 500 messages.
Placement resolution: 500 messages. CPP
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →

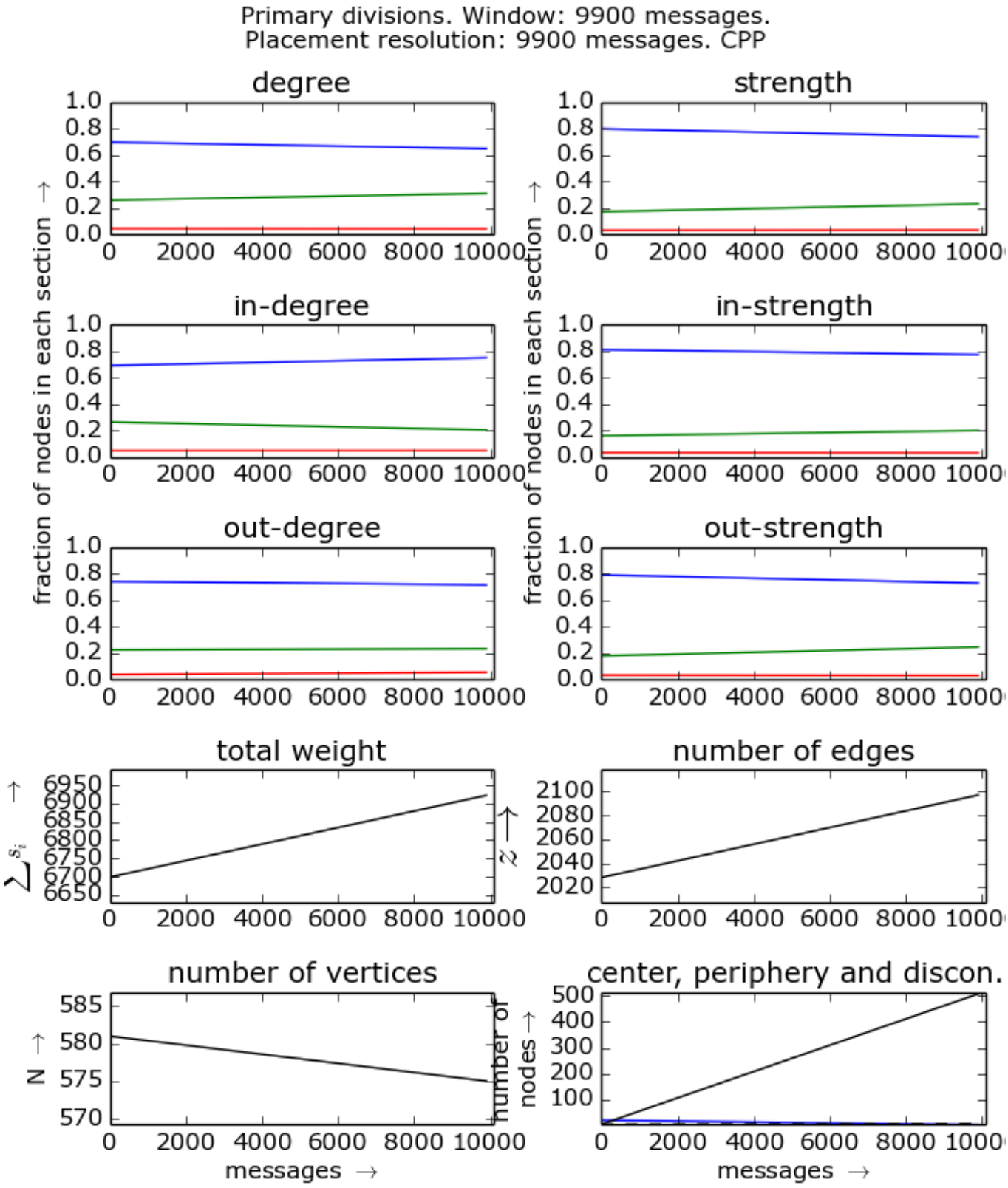

Compound divisions. Window: 500 messages.
Placement resolution: 500 messages. CPP
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000

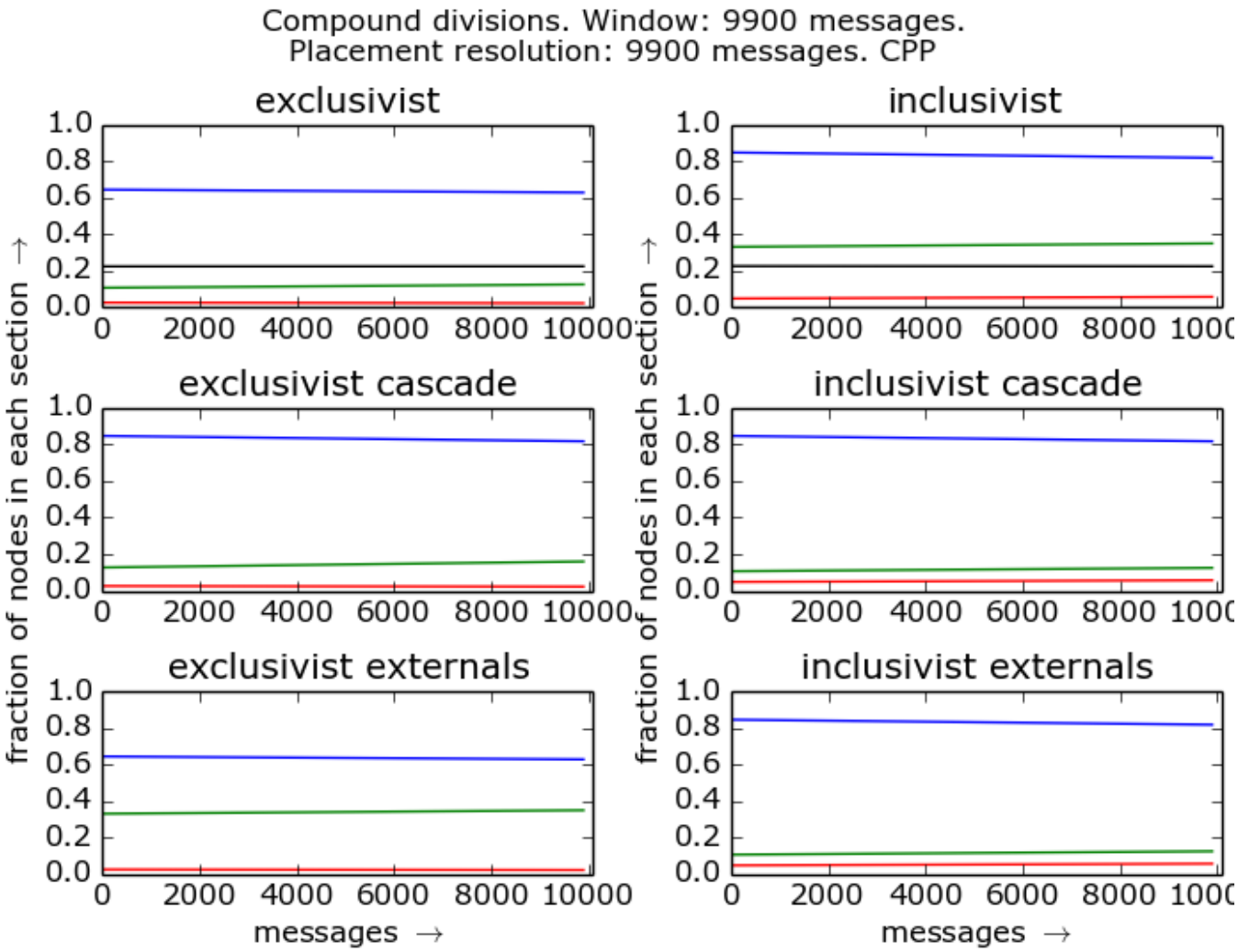

Primary divisions. Window: 1000 messages.
Placement resolution: 1000 messages. CPP
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →


Compound divisions. Window: 1000 messages.
Placement resolution: 1000 messages. CPP
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000

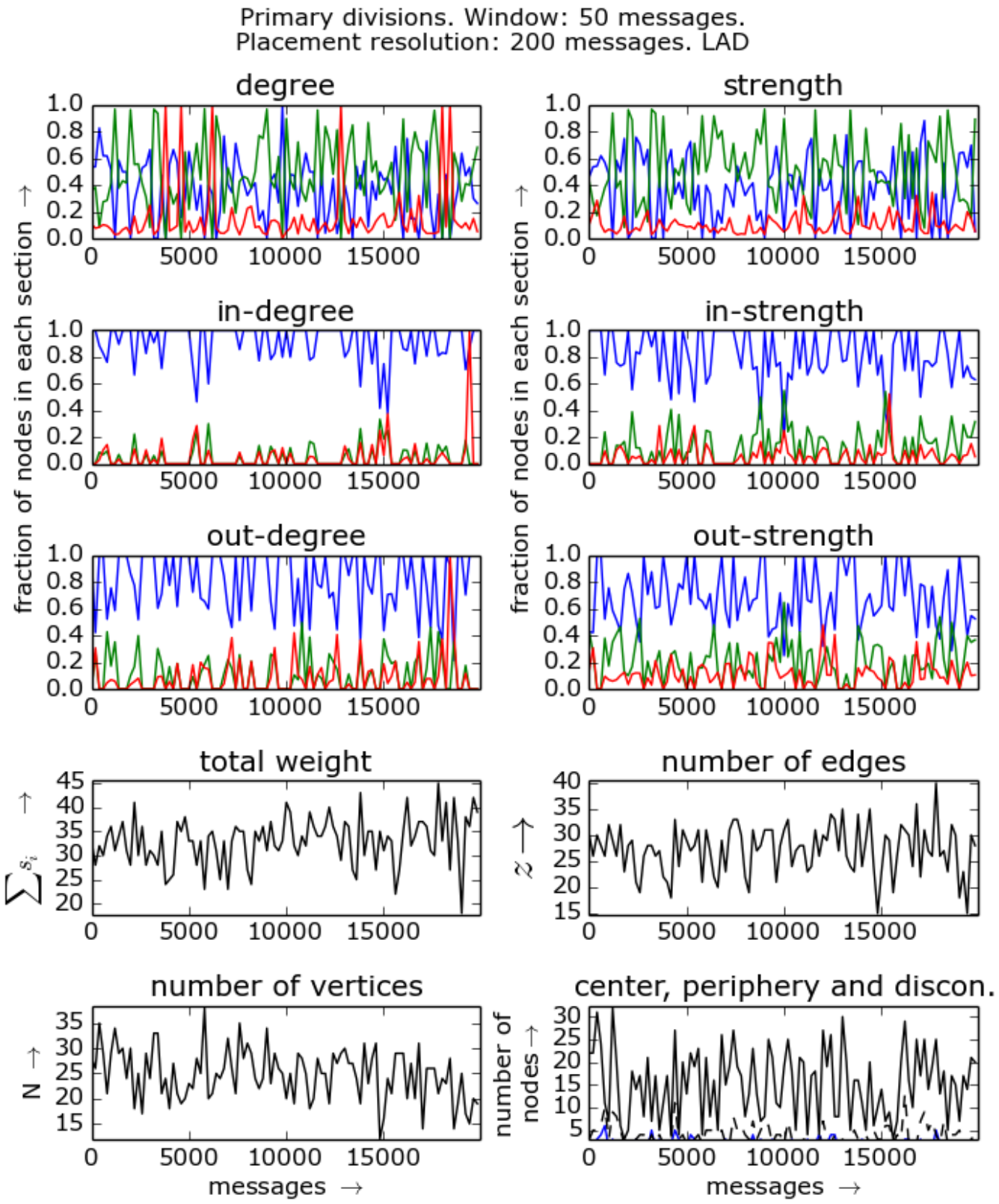

Primary divisions. Window: 3300 messages.
Placement resolution: 3300 messages. CPP
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →

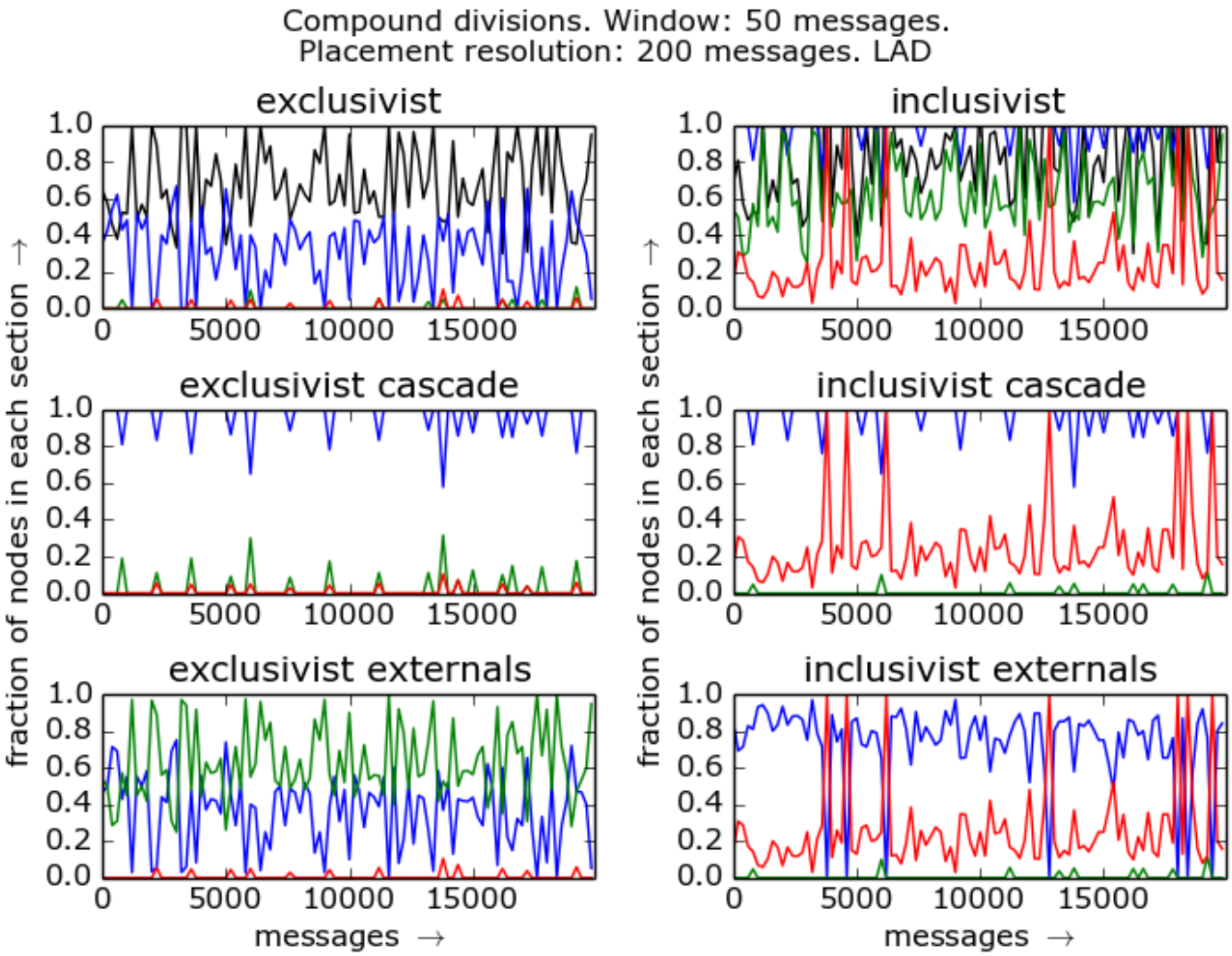

Compound divisions. Window: 3300 messages.
Placement resolution: 3300 messages. CPP
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000

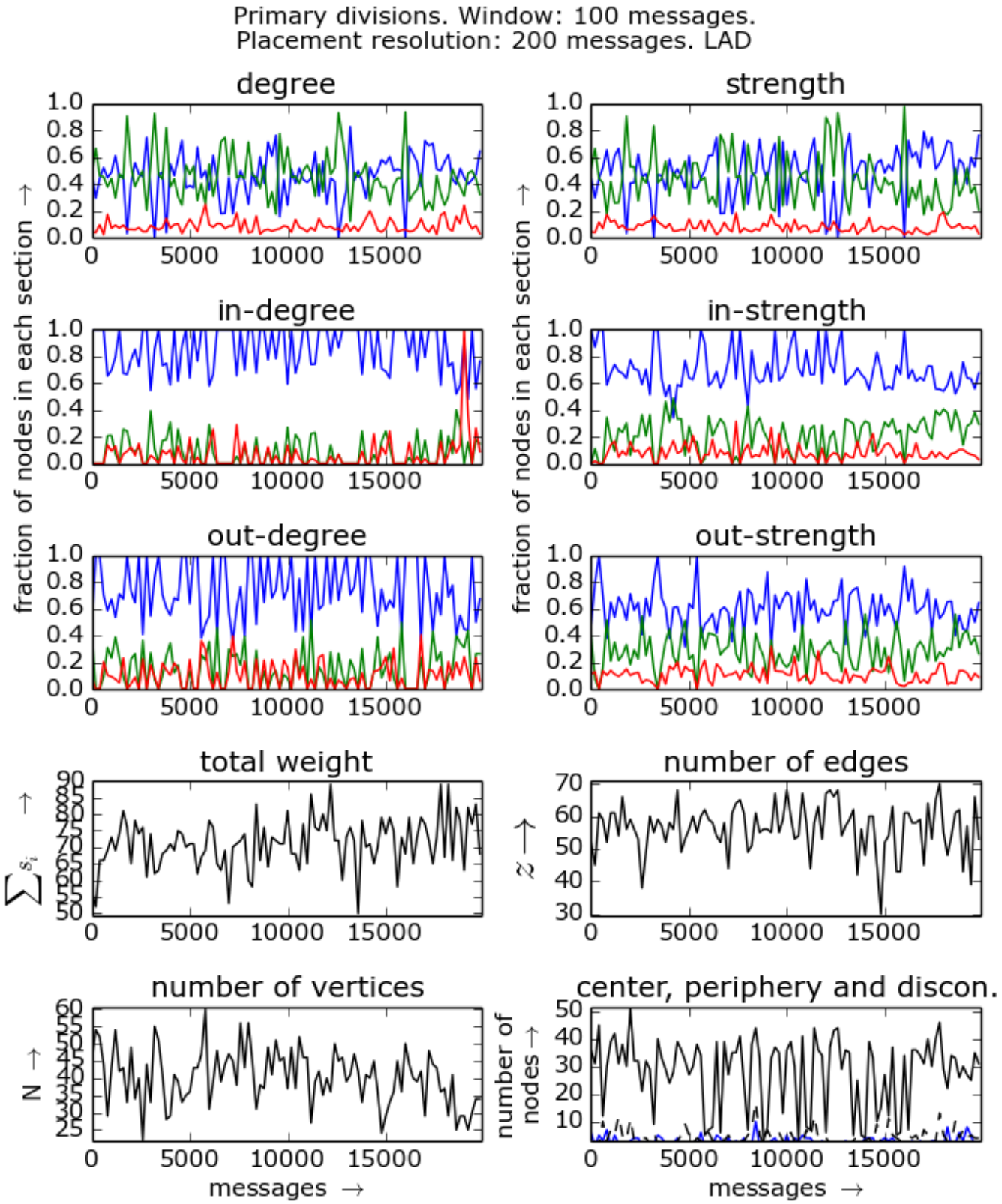

Primary divisions. Window: 9900 messages.
Placement resolution: 9900 messages. CPP
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
messages →
number of nodes →

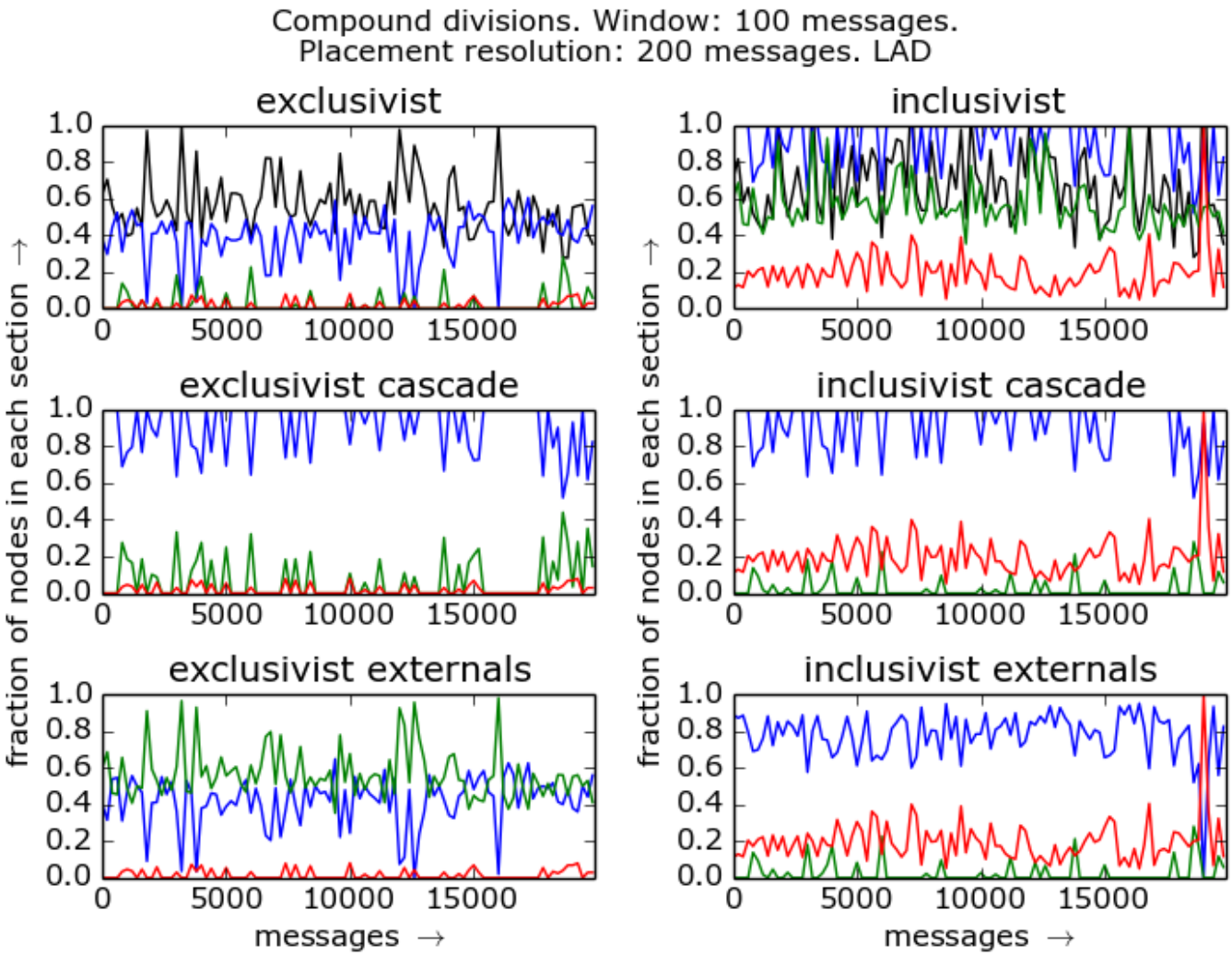

Compound divisions. Window: 9900 messages.
Placement resolution: 9900 messages. CPP
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
2000
4000
6000
8000
10000

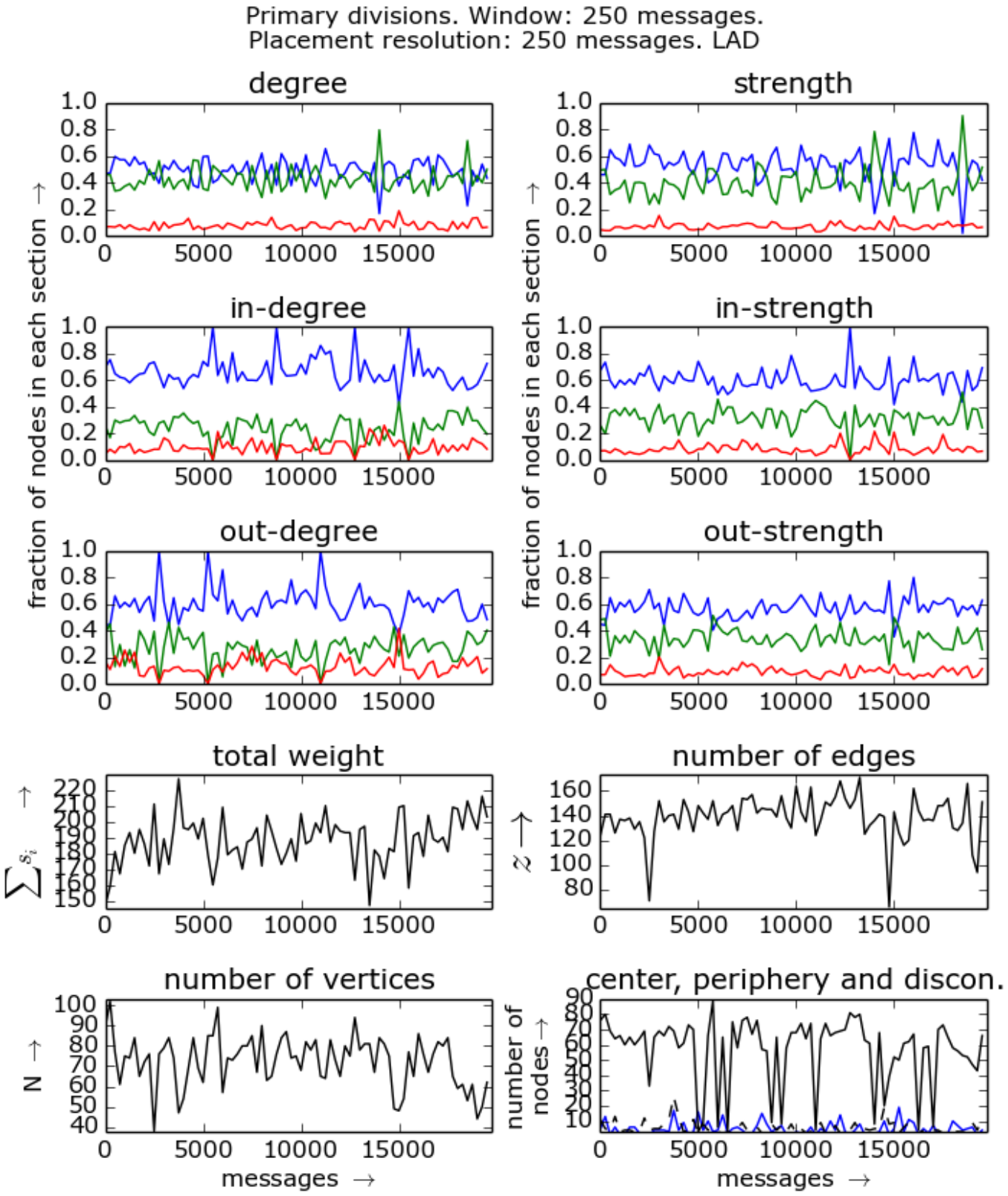
B. LAD list

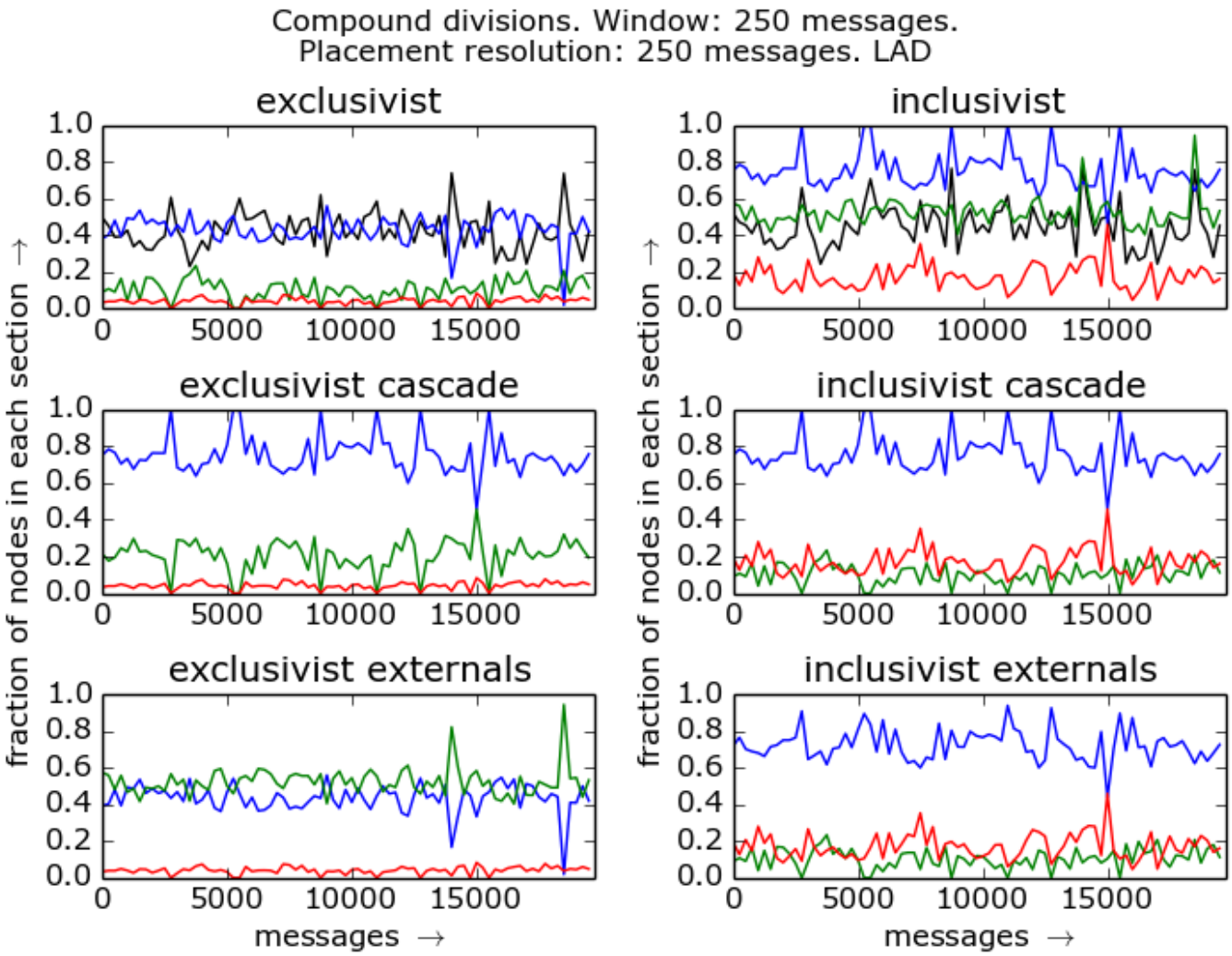

Primary divisions. Window: 50 messages.
Placement resolution: 200 messages. LAD
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →

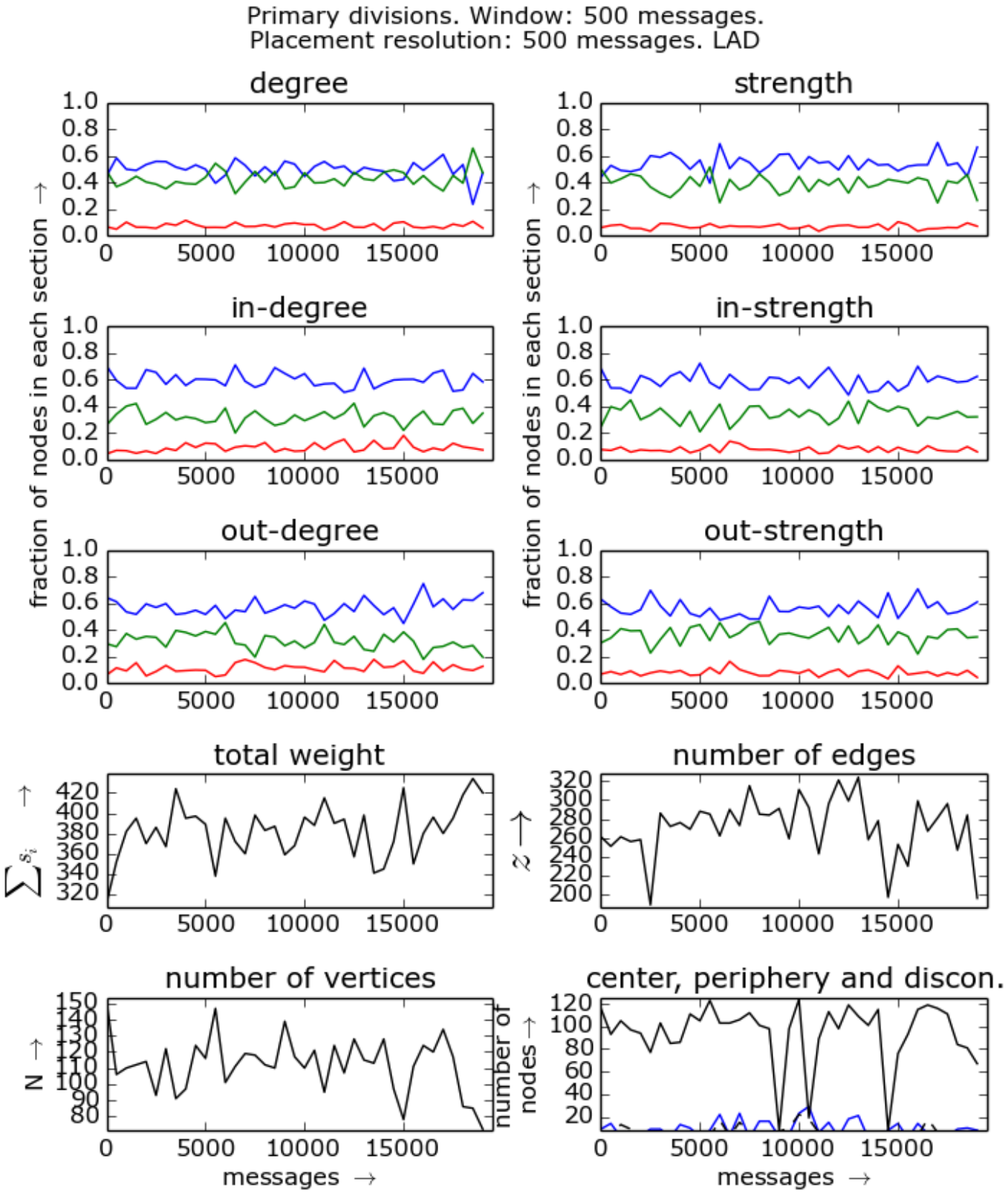

Compound divisions. Window: 50 messages.
Placement resolution: 200 messages. LAD
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000

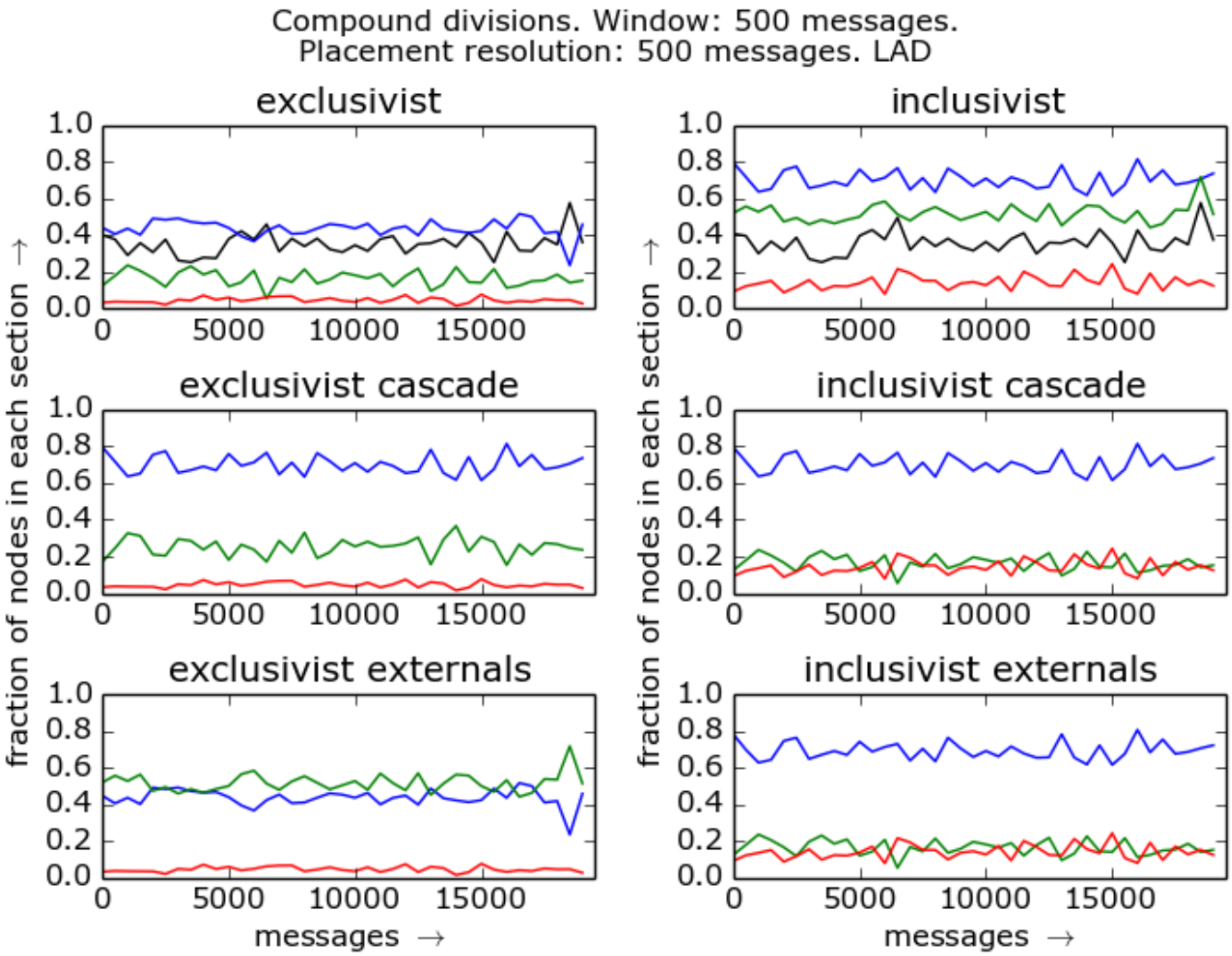

Primary divisions. Window: 100 messages.
Placement resolution: 200 messages. LAD
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →

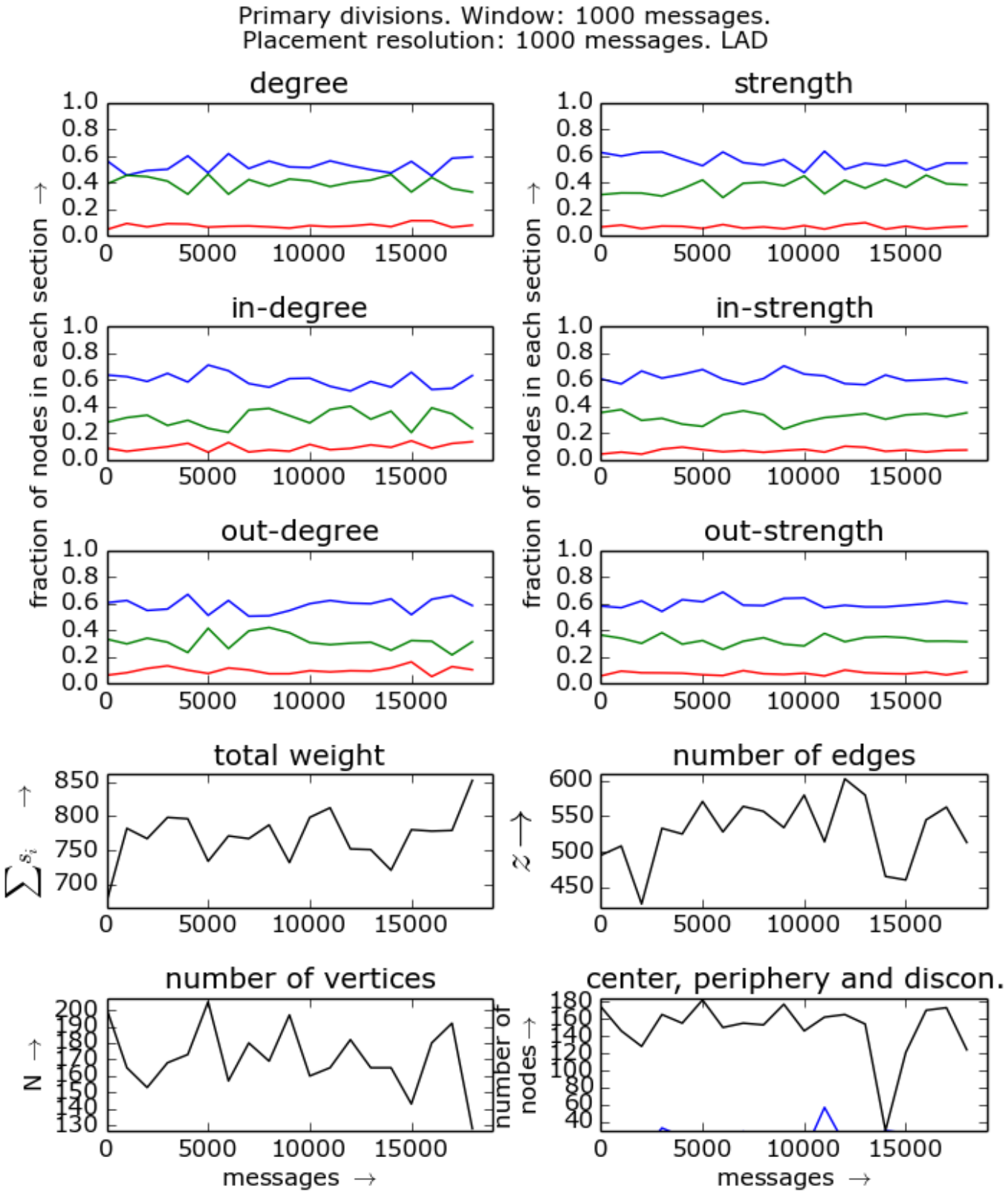

Compound divisions. Window: 100 messages.
Placement resolution: 200 messages. LAD
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000

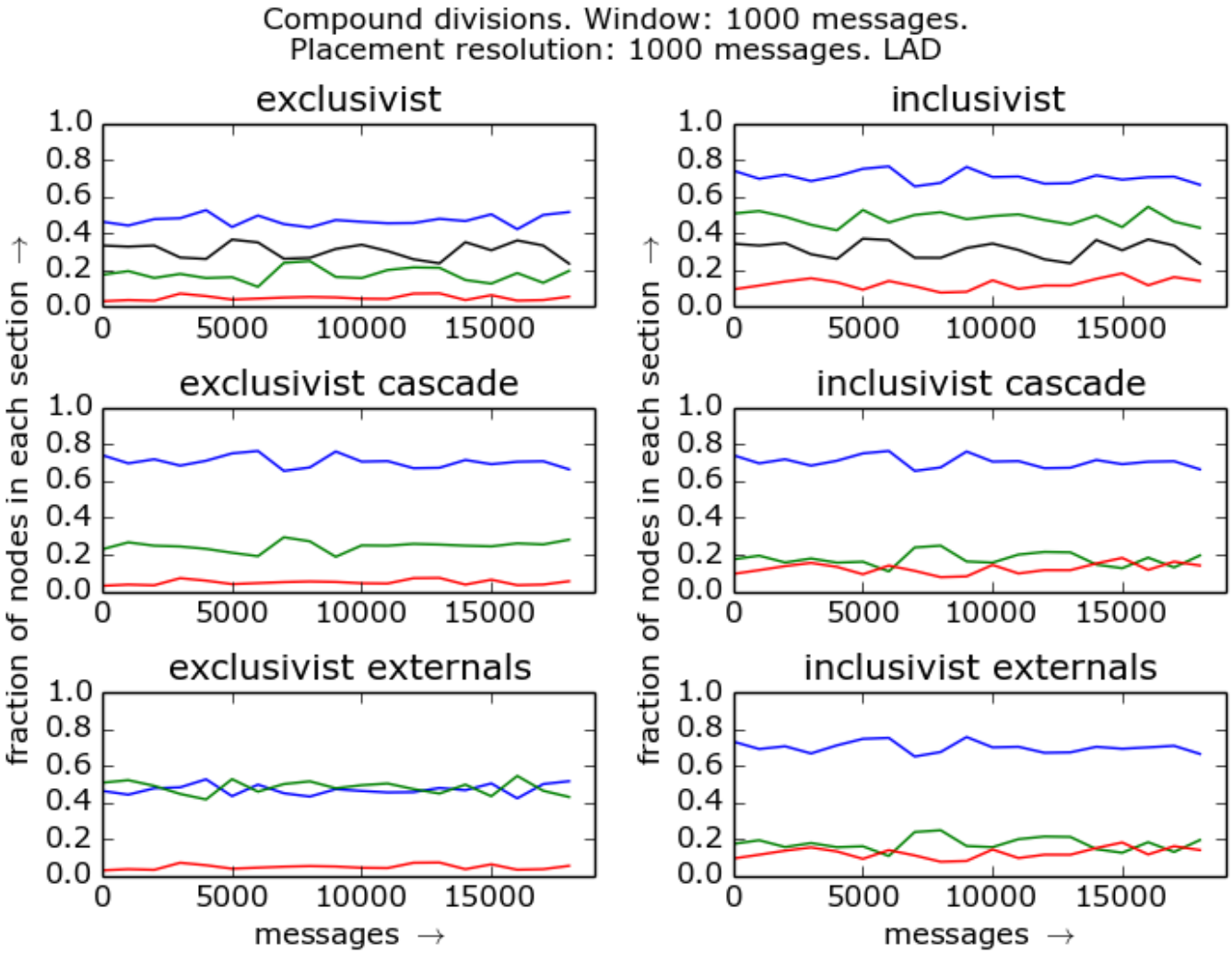

Primary divisions. Window: 250 messages.
Placement resolution: 250 messages. LAD
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →

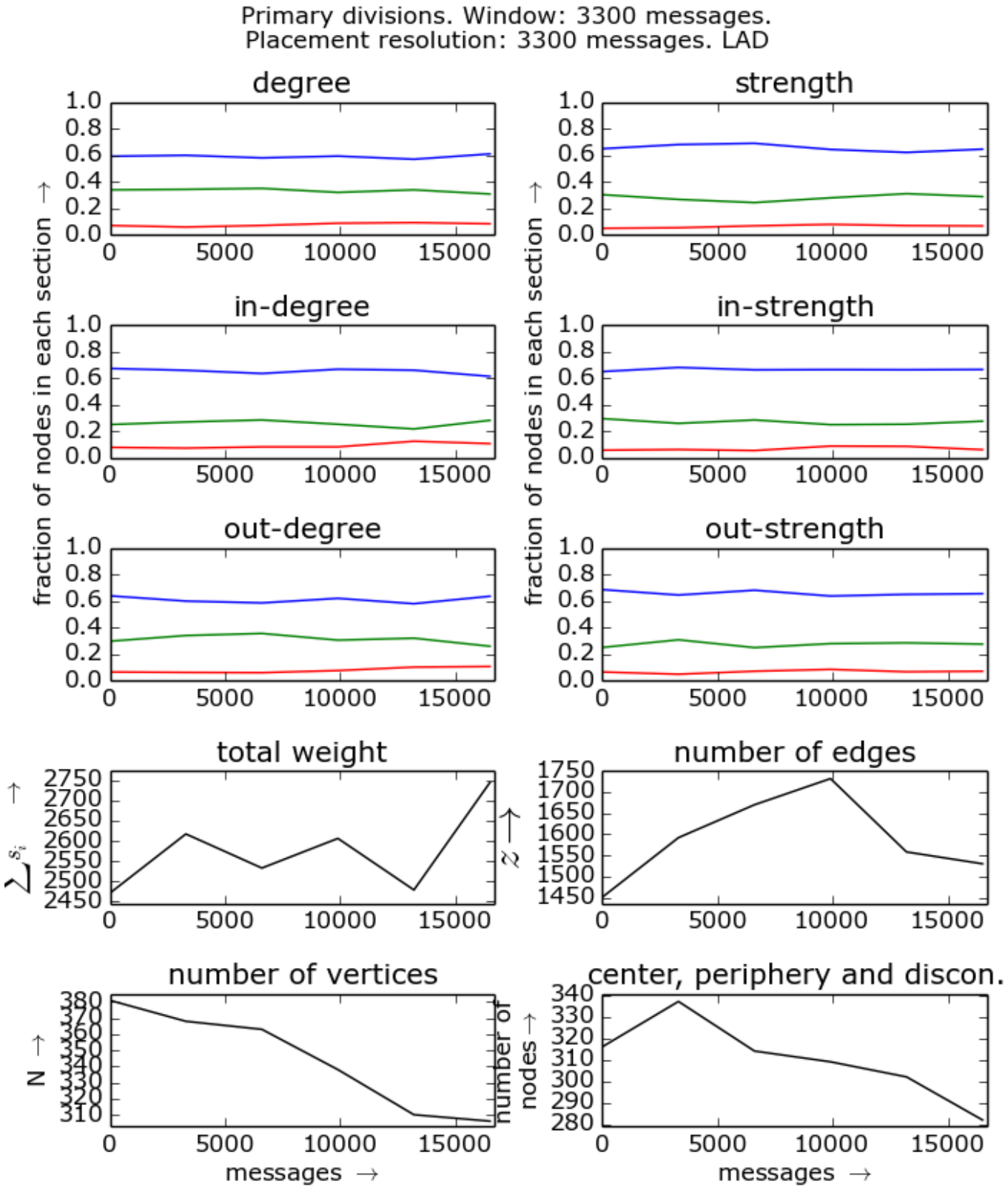

Compound divisions. Window: 250 messages.
Placement resolution: 250 messages. LAD
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000

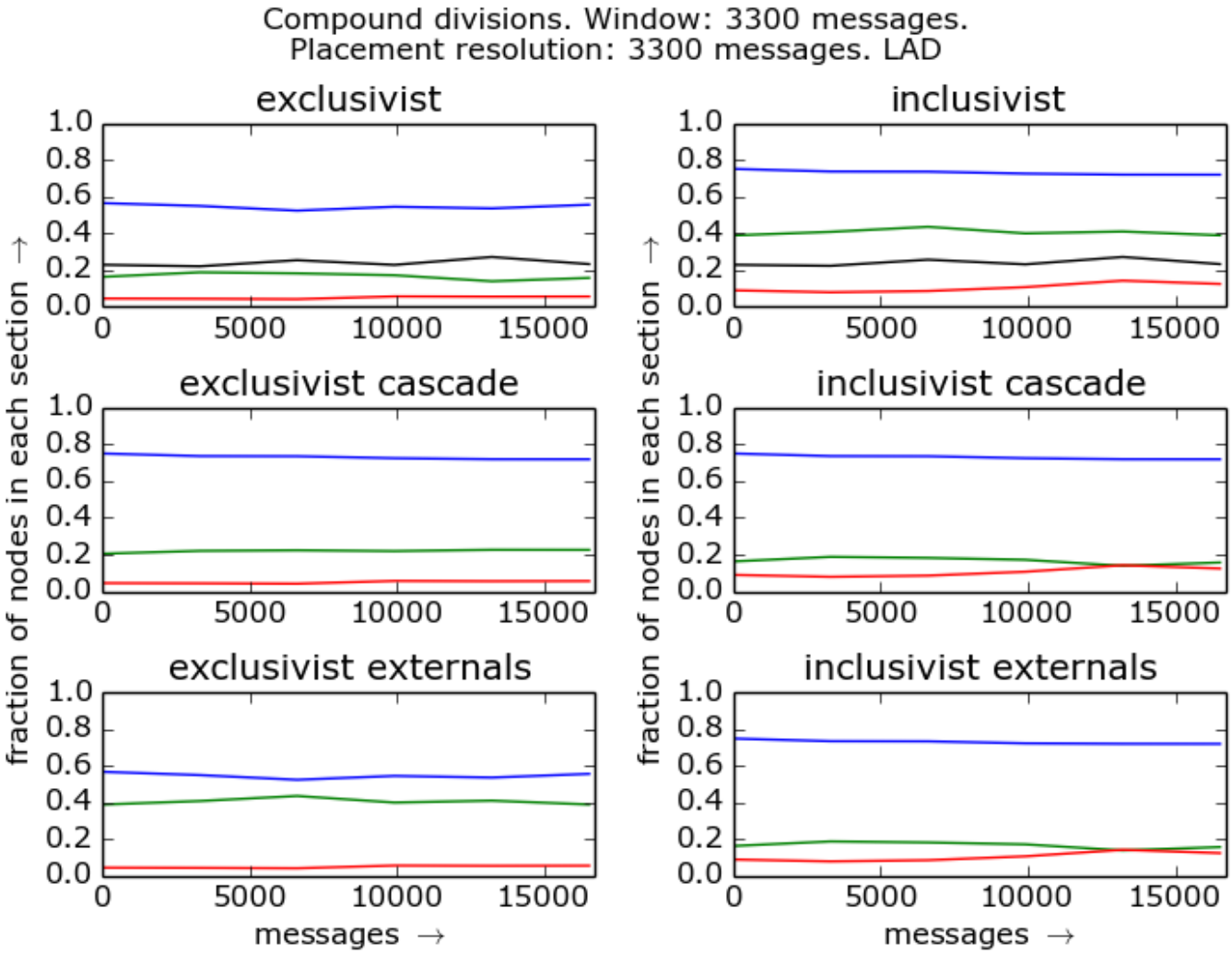

Primary divisions. Window: 500 messages.
Placement resolution: 500 messages. LAD
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →

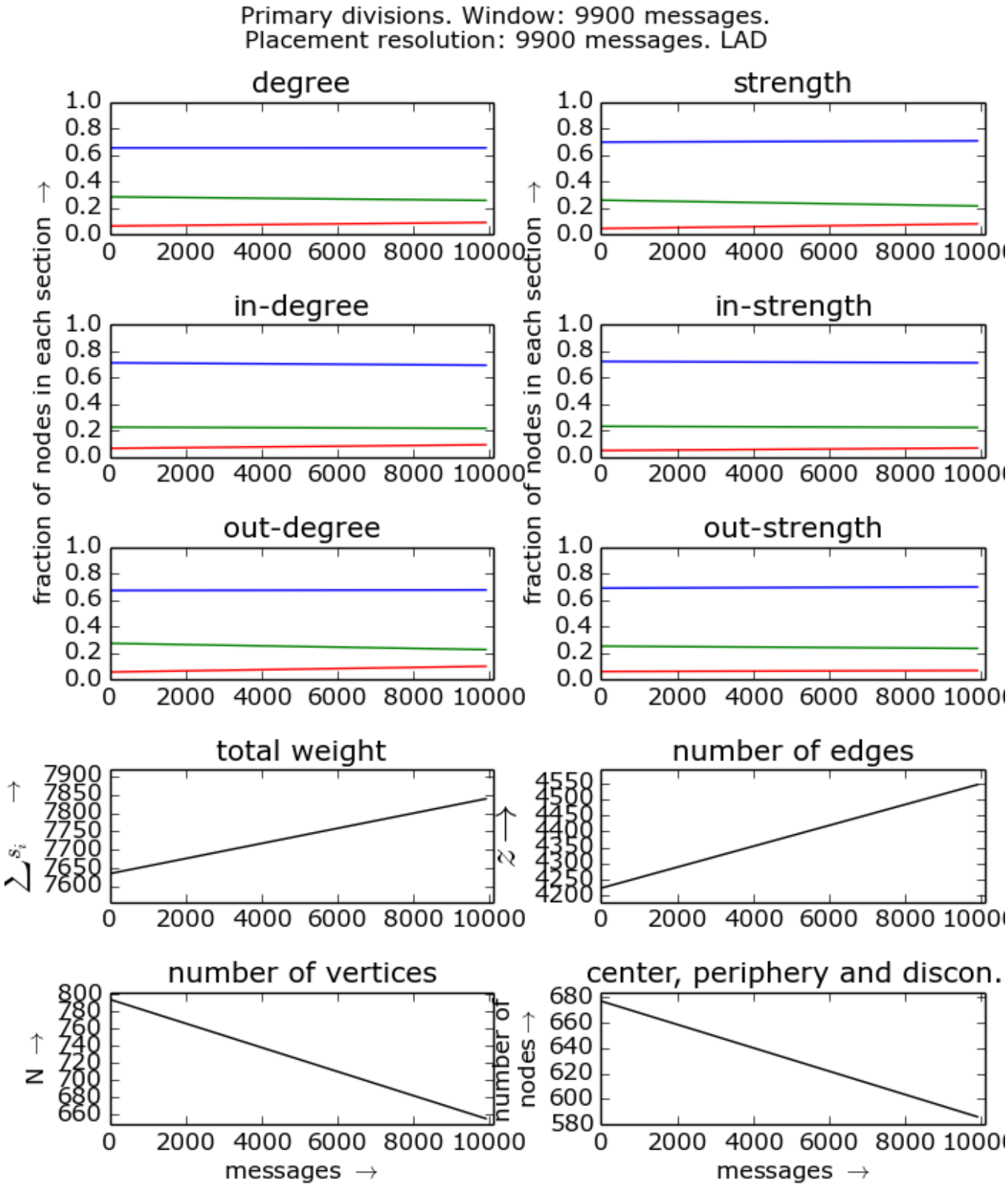

Compound divisions. Window: 500 messages.
Placement resolution: 500 messages. LAD
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000

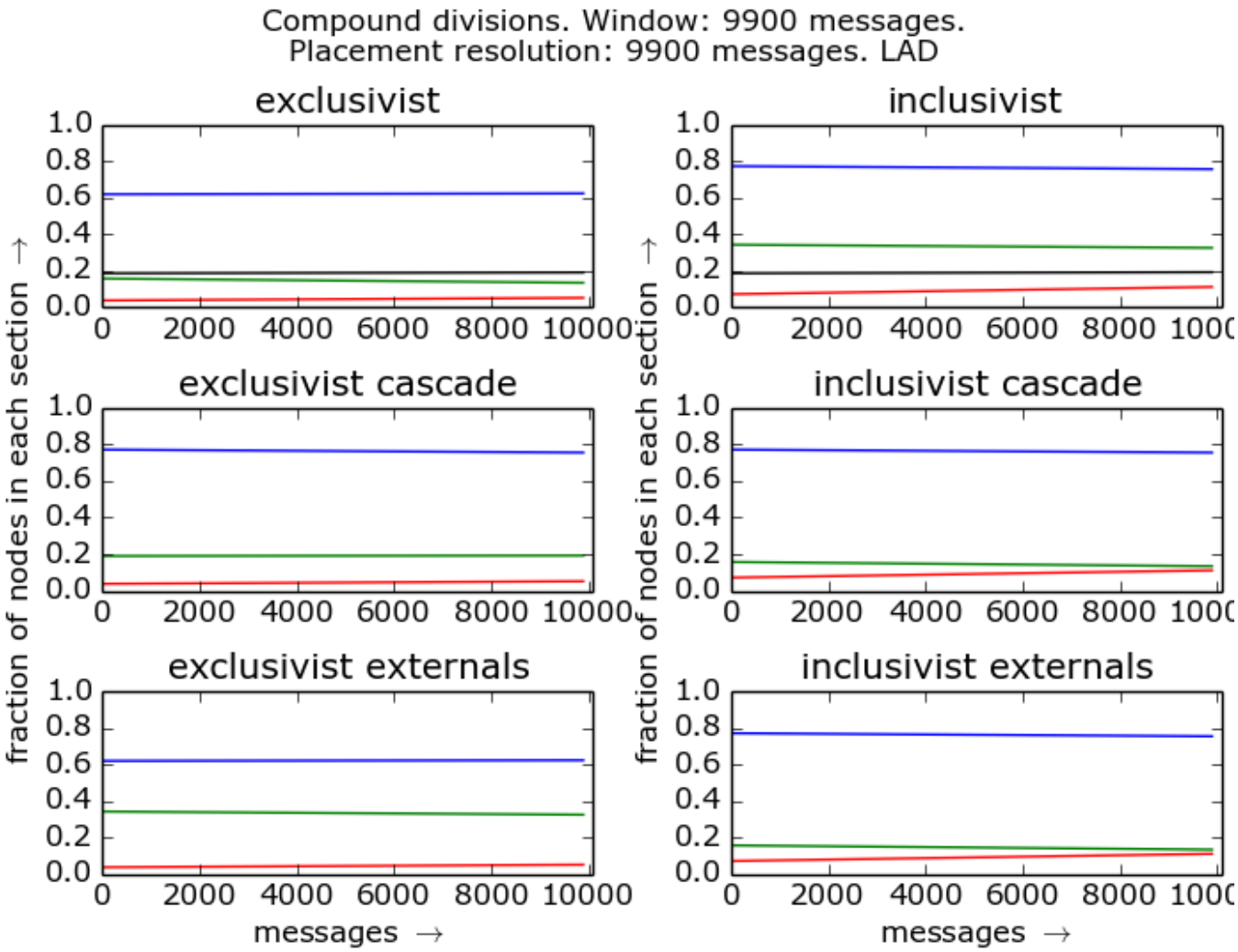

Primary divisions. Window: 1000 messages.
Placement resolution: 1000 messages. LAD
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →


Compound divisions. Window: 1000 messages.
Placement resolution: 1000 messages. LAD
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000


Primary divisions. Window: 3300 messages.
Placement resolution: 3300 messages. LAD
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →


Compound divisions. Window: 3300 messages.
Placement resolution: 3300 messages. LAD
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
5000
10000
15000


Primary divisions. Window: 9900 messages.
Placement resolution: 9900 messages. LAD
degree
strength
in-degree
in-strength
out-degree
out-strength
fraction of nodes in each section →
total weight
number of edges
number of vertices
center, periphery and discon.
N →
number of nodes →
messages →


Compound divisions. Window: 9900 messages.
Placement resolution: 9900 messages. LAD
exclusivist
inclusivist
exclusivist cascade
inclusivist cascade
exclusivist externals
inclusivist externals
fraction of nodes in each section →
messages →
0.0
0.2
0.4
0.6
0.8
1.0
0
2000
4000
6000
8000
10000

III. PCA OF MEASURES ALONG THE TIMELINE

Loadings for the 14 metrics into the principal components for the MET list, $ws = 1000$ messages in 20 disjoint positioning. The clustering coefficient (cc) appears as the first metric in the Table, followed by 7 centrality metrics and 6 symmetry-related metrics. Note that the centrality measurements, including degrees, strength and betweenness centrality, are the most important contributors for the first principal component, while the second component is dominated by symmetry metrics. The clustering coefficient is only relevant for the third principal component. The three components have in average 80.36% of the variance.

A. Betweenness, clustering and degree

TABLE XVII. LAU principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	6.03	3.73	87.60	5.25	4.52	0.93
k	47.13	1.76	3.01	1.98	47.90	0.38
bt	46.84	1.97	9.39	4.31	47.58	0.57
λ	64.99	0.60	33.08	0.41	1.93	0.36

TABLE XVIII. LAD principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	6.42	4.05	86.60	5.50	5.19	1.45
k	46.98	1.86	2.95	1.65	47.61	0.57
bt	46.59	2.18	10.45	4.72	47.20	0.90
λ	64.96	0.71	33.08	0.41	1.96	0.52

TABLE XIX. MET principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	5.82	3.76	87.26	5.12	4.93	1.19
k	47.18	1.82	4.35	4.01	47.63	0.57
bt	47.01	1.96	8.40	4.22	47.44	0.67
λ	64.94	0.76	33.13	0.45	1.93	0.62

TABLE XX. CPP principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	3.61	2.13	91.86	3.24	3.59	0.98
k	48.24	0.99	2.96	2.25	48.25	0.43
bt	48.15	1.14	5.18	3.89	48.16	0.56
λ	65.24	0.51	33.30	0.17	1.46	0.49

B. Betweenness, clustering, degrees and strengths

TABLE XXI. LAU principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	1.59	0.81	80.37	5.18	3.09	1.89
s	14.40	0.15	0.81	0.68	4.75	4.43
s^{in}	14.00	0.14	2.32	1.49	18.98	4.93
s^{out}	13.96	0.14	2.72	1.44	18.25	6.36
k	14.49	0.15	0.54	0.35	1.37	0.98
k^{in}	14.01	0.13	2.72	1.35	18.69	5.01
k^{out}	13.85	0.13	2.37	1.73	22.63	3.79
bt	13.69	0.22	8.16	1.62	12.23	8.33
λ	81.87	0.88	12.48	0.15	3.33	0.70

TABLE XXII. LAD principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	1.83	1.11	80.38	11.45	3.78	4.43
s	14.25	0.17	1.34	1.81	9.88	5.76
s^{in}	13.99	0.19	2.06	1.70	17.62	6.15
s^{out}	14.03	0.22	1.81	1.98	15.44	6.68
k	14.38	0.13	0.95	1.64	3.45	3.15
k^{in}	14.05	0.14	2.26	1.66	13.44	7.26
k^{out}	13.96	0.15	1.72	1.53	16.14	6.37
bt	13.51	0.35	9.48	2.86	20.26	9.87
λ	82.32	1.61	12.52	0.26	2.97	1.21

TABLE XXIII. MET principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	1.16	0.76	81.72	3.00	1.61	1.78
s	14.32	0.16	1.76	1.12	11.39	5.50
s^{in}	14.17	0.11	2.29	1.29	14.46	3.72
s^{out}	14.09	0.17	1.72	1.18	17.54	5.37
k	14.39	0.16	1.73	0.63	4.76	2.82
k^{in}	14.12	0.13	1.02	0.71	11.69	6.93
k^{out}	14.06	0.13	3.11	1.58	12.18	9.24
bt	13.69	0.26	6.64	2.01	26.37	12.37
λ	83.41	1.53	12.53	0.11	2.34	1.16

TABLE XXIV. CPP principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	0.84	0.61	80.59	6.89	2.30	2.19
s	14.28	0.07	0.97	1.03	15.89	1.15
s^{in}	14.18	0.12	2.89	1.71	13.50	5.19
s^{out}	14.07	0.23	2.83	1.63	18.80	4.94
k	14.42	0.08	0.78	0.67	7.48	2.71
k^{in}	14.29	0.10	2.36	1.41	7.21	4.49
k^{out}	14.16	0.12	3.62	1.83	8.79	4.58
bt	13.76	0.22	5.96	1.88	26.03	7.94
λ	83.32	1.42	12.60	0.08	2.61	1.15

C. Betweenness, clustering, degrees, strengths and symmetry measures

TABLE XXV. LAU principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	1.64	0.77	2.42	1.71	19.20	3.96
s	12.80	0.46	0.89	0.82	2.53	0.63
s^{in}	12.47	0.42	2.30	0.97	2.29	0.81
s^{out}	12.37	0.46	2.89	1.24	2.64	0.58
k	12.93	0.44	0.82	0.73	1.32	0.45
k^{in}	12.54	0.37	2.88	1.13	1.02	0.56
k^{out}	12.32	0.46	3.82	1.14	1.57	0.68
bt	12.19	0.46	1.06	0.62	2.64	0.89
asy	0.93	0.81	20.38	0.82	1.66	1.09
μ_{asy}	0.96	0.83	20.26	0.82	1.66	1.04
σ_{asy}	6.18	0.71	1.24	0.92	27.98	1.74
dis	0.90	0.79	20.36	0.82	1.54	1.07
μ_{dis}	0.92	0.61	19.02	0.84	1.45	1.12
σ_{dis}	0.86	0.51	1.64	1.10	32.51	1.90
λ	48.41	0.52	27.95	0.36	12.81	0.79

TABLE XXVI. LAD principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	1.96	0.95	3.07	1.46	17.94	5.38
s	12.34	0.57	1.72	0.99	2.43	0.93
s^{in}	12.06	0.64	3.18	0.98	1.98	1.09
s^{out}	12.22	0.48	1.14	0.78	2.83	0.79
k	12.54	0.56	1.43	0.87	0.92	0.44
k^{in}	12.15	0.61	3.81	0.79	0.61	0.42
k^{out}	12.27	0.45	1.51	1.08	1.56	0.39
bt	11.73	0.64	1.80	0.88	2.28	1.00
asy	1.51	0.97	19.66	1.63	3.02	1.66
μ_{asy}	1.41	0.99	19.53	1.62	3.00	1.69
σ_{asy}	5.62	0.68	2.01	1.23	27.46	3.31
dis	1.58	0.98	19.57	1.65	3.21	1.71
μ_{dis}	1.84	1.00	18.62	1.52	2.08	1.13
σ_{dis}	0.77	0.59	2.94	1.60	30.68	3.34
λ	48.65	1.03	27.84	0.31	13.00	0.77

TABLE XXVII. MET principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	1.18	0.71	3.00	2.35	22.39	2.71
s	12.34	0.66	1.74	1.17	1.55	0.75
s^{in}	12.25	0.62	1.74	0.96	1.45	0.77
s^{out}	12.11	0.72	2.42	1.35	1.78	0.78
k	12.48	0.63	1.46	0.91	0.54	0.48
k^{in}	12.32	0.56	1.54	1.22	0.65	0.62
k^{out}	12.12	0.67	3.10	1.15	0.87	0.74
bt	11.85	0.62	1.46	0.87	1.16	0.70
asy	1.79	1.22	19.35	2.15	3.29	2.15
μ_{asy}	1.84	1.22	19.17	2.16	3.31	2.23
σ_{asy}	4.17	0.79	3.91	2.35	27.79	3.96
dis	1.78	1.18	19.26	2.15	3.38	2.29
μ_{dis}	1.53	1.10	18.23	2.12	3.32	1.71
σ_{dis}	2.23	0.93	3.61	2.38	28.54	3.23
λ	49.05	1.01	27.79	0.30	13.30	1.35

TABLE XXVIII. CPP principal components formation and concentration of dispersion.

	PC1		PC2		PC3	
	μ	σ	μ	σ	μ	σ
cc	0.89	0.59	1.93	1.33	21.22	2.97
s	11.71	0.57	2.97	0.82	2.45	0.72
s^{in}	11.68	0.58	2.37	0.91	3.08	0.78
s^{out}	11.49	0.61	3.63	0.79	1.61	0.88
k	11.93	0.54	2.58	0.70	0.52	0.44
k^{in}	11.93	0.52	1.19	0.88	1.41	0.71
k^{out}	11.57	0.61	4.34	0.70	0.98	0.66
bt	11.37	0.55	2.44	0.84	1.37	0.77
asy	3.14	0.98	18.52	1.97	2.46	1.69
μ_{asy}	3.32	0.99	18.23	2.01	2.80	1.82
σ_{asy}	4.91	0.59	2.44	1.47	26.84	3.06
dis	2.94	0.88	18.50	1.92	3.06	1.98
μ_{dis}	2.55	0.89	18.12	1.85	1.57	1.32
σ_{dis}	0.57	0.33	2.74	1.63	30.61	2.66
λ	49.56	1.16	27.14	0.54	13.25	0.95

IV. STABILITY IN OTHER NETWORKS: TWITTER, FACEBOOK, PARTICIPA.BR

To further verify the hypothesis that such stability is a general property of human social networks, we analyzed networks driven from Twitter, Facebook and Participa.br. Selected networks are summarized in Table **??**. Their Erdös sector relative sizes are given in Table XXIX. PCA formations are given in Tables XXXI, XXX, **??** and **??**.

TABLE XXIX. Sec extra.

	p.	i.	h.
F1	63.65	33.10	3.25
F2	64.39	34.38	1.22
F3	65.41	31.87	2.72
F4	69.52	29.39	1.10
F5	62.98	36.12	0.90
I1	4.81	94.23	0.96
I2	53.12	45.31	1.56
I3	58.41	40.19	1.40
I4	39.06	59.43	1.51
I5	54.95	43.69	1.35
TT	74.86	24.49	0.65
TT2	76.57	22.86	0.57

[1] R. Fabbri, "Stability in human interaction networks: vertices sectorialization, prominence of topological measures and time activity statistics," arXiv preprint arXiv:1310.7769. http://arxiv.org/abs/1310.7769.

TABLE XXX. PCA1 of friendship networks

	PC1					PC2					PC3				
	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5	F1	F2	F3	F4	F5
cc	27.43	15.42	11.54	11.94	0.94	54.37	72.77	68.86	77.74	88.86	24.80	13.82	18.20	12.32	5.90
k	40.17	43.50	45.61	44.87	49.50	1.64	1.54	6.10	0.37	6.42	42.95	44.37	42.00	44.67	47.02
bt	32.40	41.07	42.85	43.19	49.56	43.99	25.69	25.04	21.88	4.72	32.25	41.81	39.80	43.01	47.08
λ	55.81	53.39	46.26	55.57	63.80	30.99	33.01	34.27	33.40	33.57	13.19	13.60	19.47	11.04	2.63

TABLE XXXI. PCA1 of interaction networks

	PC1							PC2							PC3						
	I1	I2	I3	I4	I5	TT1	TT2	I1	I2	I3	I4	I5	TT1	TT2	I1	I2	I3	I4	I5	TT1	TT2
cc	14.43	17.12	11.54	0.69	13.26	2.17	2.72	74.78	70.72	79.30	96.63	76.59	95.75	94.69	1.58	4.09	2.46	1.71	0.57	2.03	2.20
k	42.68	41.77	44.37	49.65	43.41	48.94	48.67	13.85	11.48	8.31	2.35	11.26	0.14	0.52	49.07	48.42	48.94	49.14	49.76	49.01	48.93
bt	42.89	41.11	44.09	49.66	43.34	48.89	48.61	11.37	17.80	12.39	1.02	12.15	4.12	4.79	49.35	47.49	48.60	49.15	49.67	48.96	48.87
λ	64.58	61.97	56.95	62.01	50.92	64.82	64.83	31.57	30.98	32.56	33.35	32.51	33.33	33.32	3.85	7.05	10.50	4.64	16.57	1.85	1.86

TABLE XXXII. PCA2 of interaction networks

	PC1							PC2							PC3						
	I1	I2	I3	I4	I5	TT1	TT2	I1	I2	I3	I4	I5	TT1	TT2	I1	I2	I3	I4	I5	TT1	TT2
cc	2.79	4.34	2.57	0.82	1.29	0.66	0.76	28.44	9.46	3.29	21.95	6.95	29.82	30.04	32.24	60.89	80.24	43.85	3.81	33.84	33.54
s	15.28	15.84	16.46	16.01	16.70	15.49	15.47	3.78	4.95	2.90	3.26	17.78	1.95	2.05	1.95	0.34	0.87	4.84	11.15	0.52	0.43
s^{in}	14.48	12.81	13.62	14.63	4.50	11.85	11.84	11.77	18.29	17.41	12.44	16.19	19.03	18.81	5.38	5.03	0.93	11.16	30.41	21.48	21.71
s^{out}	12.13	12.12	12.59	12.91	19.02	13.87	13.85	17.19	16.79	20.12	18.81	8.90	13.42	13.43	19.35	7.90	3.11	11.38	14.58	12.91	12.92
k	15.32	16.22	16.12	16.20	21.12	15.48	15.46	3.13	4.18	6.25	2.88	9.26	3.32	3.24	1.84	0.09	1.16	0.11	2.22	4.26	4.30
k^{in}	14.49	13.56	12.90	15.34	7.29	12.99	12.98	10.45	16.50	19.68	11.13	20.75	17.89	17.86	8.78	4.07	1.26	6.07	15.41	14.67	14.65
k^{out}	11.70	11.25	11.80	9.24	21.09	14.20	14.19	19.14	20.50	21.19	26.13	0.19	12.36	12.28	18.80	7.50	4.68	20.44	10.57	12.14	12.20
bt	13.82	13.86	13.93	14.86	8.99	15.47	15.45	6.10	9.32	9.16	3.41	19.99	2.20	2.29	11.66	14.20	7.75	2.17	11.86	0.18	0.25
λ	71.73	60.58	60.35	64.53	41.28	70.06	70.08	15.23	21.53	20.13	16.42	22.83	13.83	13.86	9.95	11.37	12.25	11.19	15.71	11.43	11.38

TABLE XXXIII. PCA3 of interaction networks

	PC1							PC2							PC3						
	I1	I2	I3	I4	I5	TT1	TT2	I1	I2	I3	I4	I5	TT1	TT2	I1	I2	I3	I4	I5	TT1	TT2
cc	3.46	4.19	2.44	0.36	2.18	1.28	1.17	3.06	1.61	1.23	1.19	2.57	3.03	2.17	17.36	16.88	21.68	17.00	10.00	18.65	19.13
s	10.05	9.21	9.60	9.31	3.54	10.27	10.59	5.81	5.74	7.33	8.47	9.24	6.26	5.96	4.58	8.02	4.91	2.21	13.10	0.92	1.53
s^{in}	9.57	8.03	9.21	8.74	0.78	7.75	7.99	4.63	0.59	1.27	6.69	2.77	5.38	5.29	8.22	12.82	9.18	6.53	7.63	5.90	4.77
s^{out}	7.88	6.21	5.45	6.97	5.76	9.25	9.54	6.78	10.23	12.76	9.20	10.26	5.27	4.92	5.90	2.99	3.86	8.43	10.84	4.58	4.76
k	10.44	10.02	9.88	10.39	5.80	10.80	11.05	4.62	5.13	5.66	5.54	14.08	4.48	4.29	3.63	6.02	6.18	1.86	1.21	1.33	1.30
k^{in}	10.12	9.30	9.50	9.98	4.43	8.64	8.86	2.69	0.70	0.88	4.49	9.61	5.40	5.50	7.12	10.55	8.70	6.17	8.24	7.27	6.54
k^{out}	7.27	5.29	4.43	5.43	9.11	10.10	10.33	8.36	12.52	13.63	5.65	11.61	3.38	3.08	7.82	5.77	2.07	13.52	5.68	5.00	4.65
bt	9.62	7.97	7.53	8.93	2.25	10.47	10.78	3.77	8.42	9.14	6.95	8.12	5.60	5.29	2.72	0.42	1.99	2.74	8.66	1.16	1.60
asy	5.42	7.05	7.97	8.48	15.47	6.16	5.79	14.17	12.88	11.78	11.02	4.67	12.48	13.39	2.95	1.03	0.58	2.71	0.87	6.54	5.80
μ_{asy}	5.48	6.99	7.99	8.47	15.44	6.18	5.80	14.12	13.04	11.78	11.01	4.72	12.46	13.37	2.92	0.76	0.75	2.77	0.76	6.58	5.83
σ_{asy}	6.53	7.39	7.63	7.15	2.37	5.59	5.48	1.69	3.80	1.75	8.46	7.49	5.94	5.45	11.32	8.91	11.14	3.04	15.54	13.70	15.31
dis	5.02	6.67	7.78	8.08	15.41	5.98	5.59	14.12	13.41	11.92	11.53	4.80	12.45	13.38	4.99	1.40	0.67	3.02	0.83	7.44	6.69
μ_{dis}	5.33	7.01	7.24	6.92	14.34	5.49	5.14	13.33	10.15	9.47	8.02	5.05	11.86	12.65	1.66	7.08	5.72	11.38	2.68	0.77	0.66
σ_{dis}	3.82	4.68	3.34	0.81	3.12	2.03	1.88	2.85	1.77	1.39	1.77	5.00	6.01	5.24	18.82	17.36	22.58	18.61	13.97	20.16	21.42
λ	46.11	43.48	44.29	46.95	30.34	44.12	43.52	26.42	24.97	24.76	19.99	23.91	25.98	26.13	14.90	14.72	11.82	13.16	17.32	11.62	12.15