Global Wind Change

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Database

- Global Surface Summary of Day
  —— from National Climatic Data Center (NCDC)

- Over 9,000 stations' data, recorded since 1929.

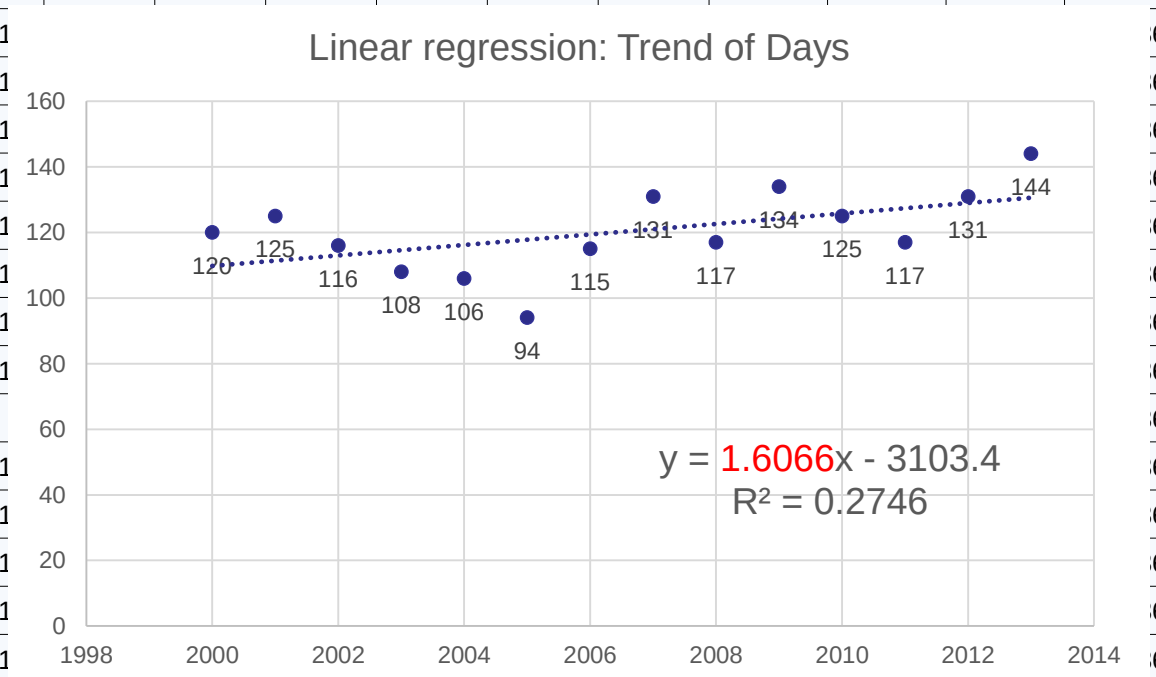
- No less than 10 years' reliable data (with more than 360 days of observation within the year) are available in 6,339 stations.

Data Processing

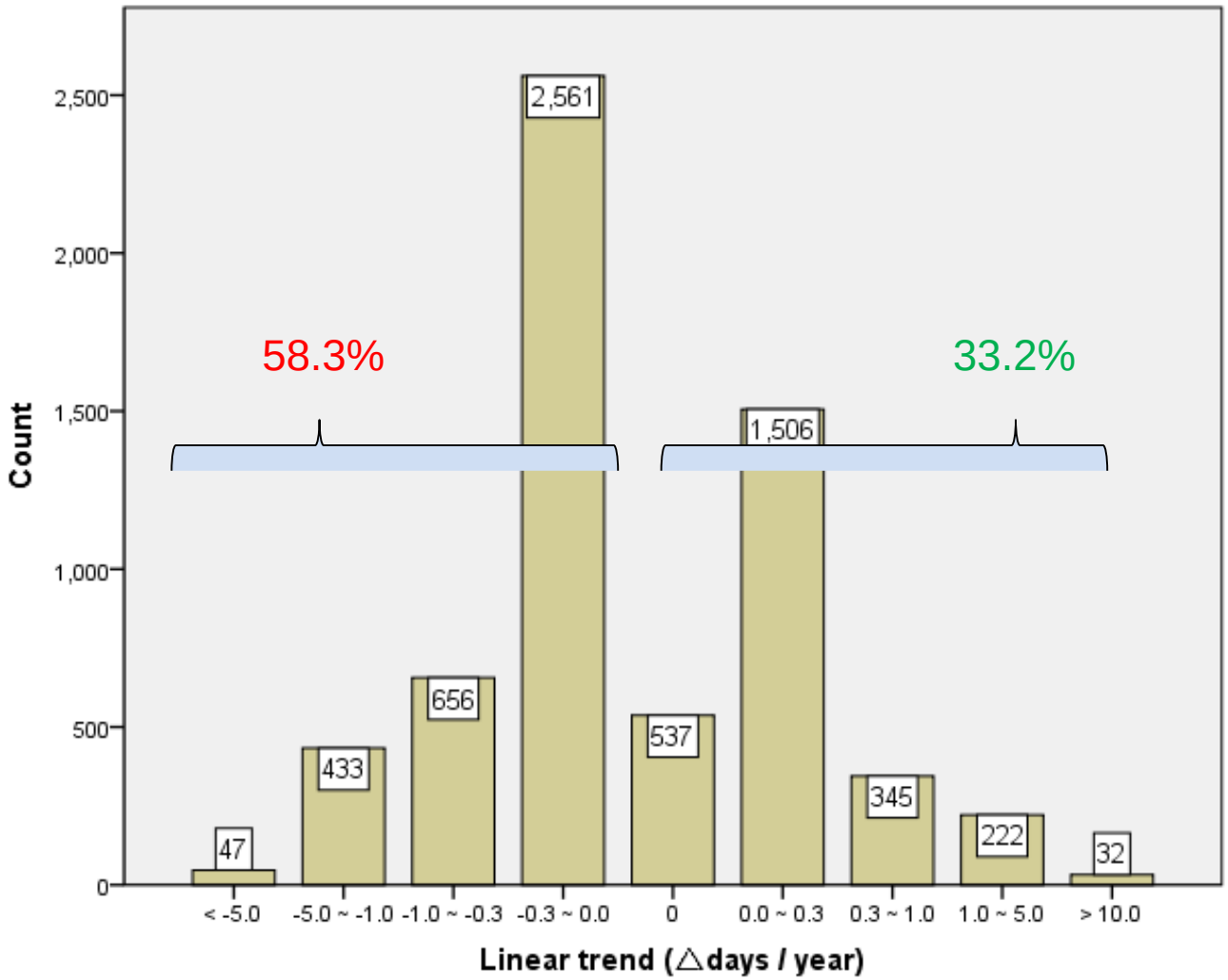
- Mean wind speed for a day in knots (0.1 knot).
- Level of mean wind speed determined according to Beaufort wind scale.
- Wind level counts (in a year): Numbers of days with different wind levels.

- Linear regression trend analysis:
- An example:

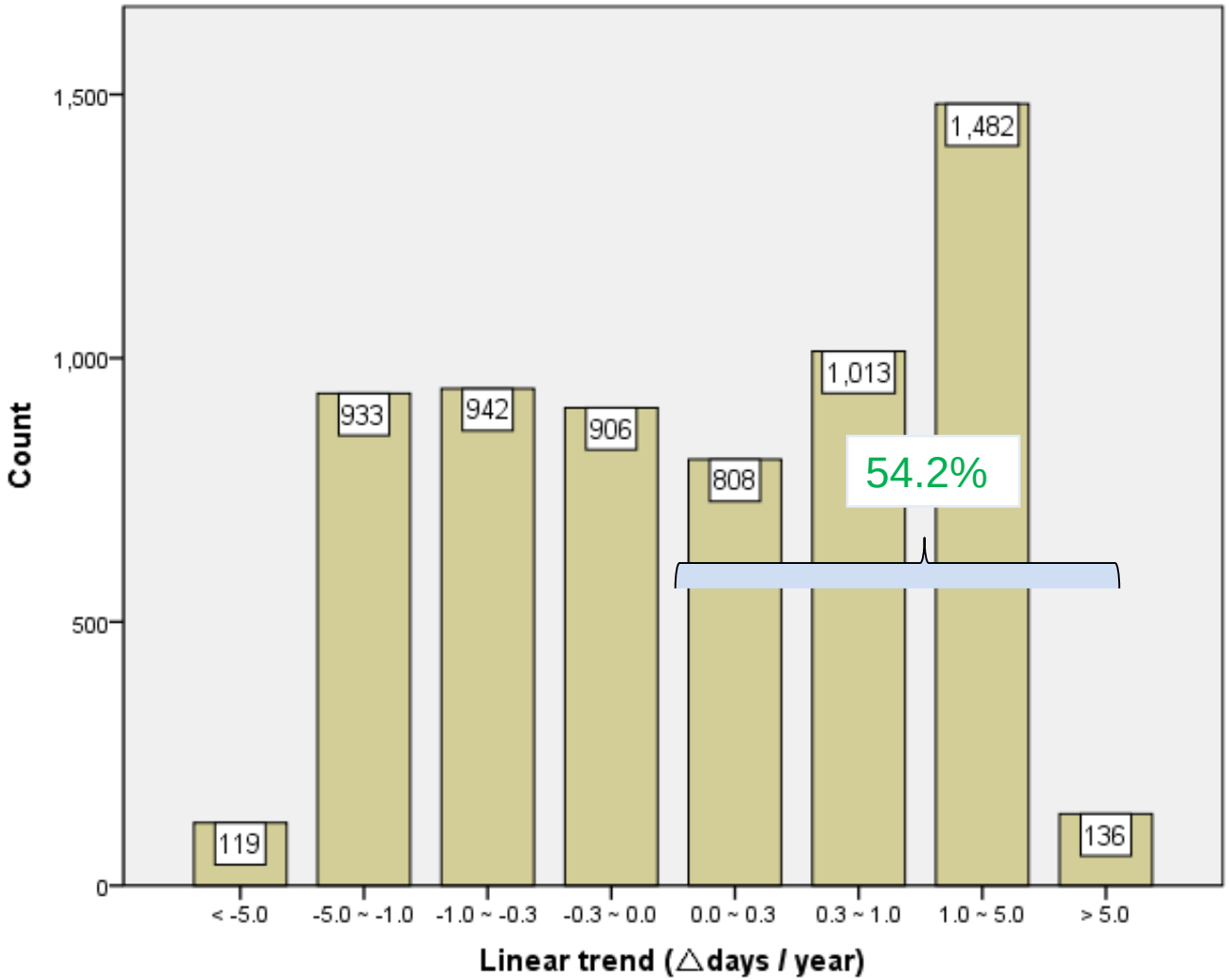
STATION 325830														
	DAYS													
YEAR	LEVEL 0	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8	LEVEL 9	LEVEL 10	LEVEL 11	LEVEL 12	TOTAL
2000	0	42	120	1										66
2001	1	31	125	1										65
2002	1	32	116	1										64
2003	1	36	108	1										64
2004	2	35	106	1										65
2005	1	38	94	1										65
2006	2	62	115	1										65
2007	2	48	131	1										63
2008	3	80	117											66
2009	1	63	134	1										65
2010	1	40	125	1										65
2011	2	57	117	1										65
2012	2	53	131	1										66
2013	1	39	144	1										65



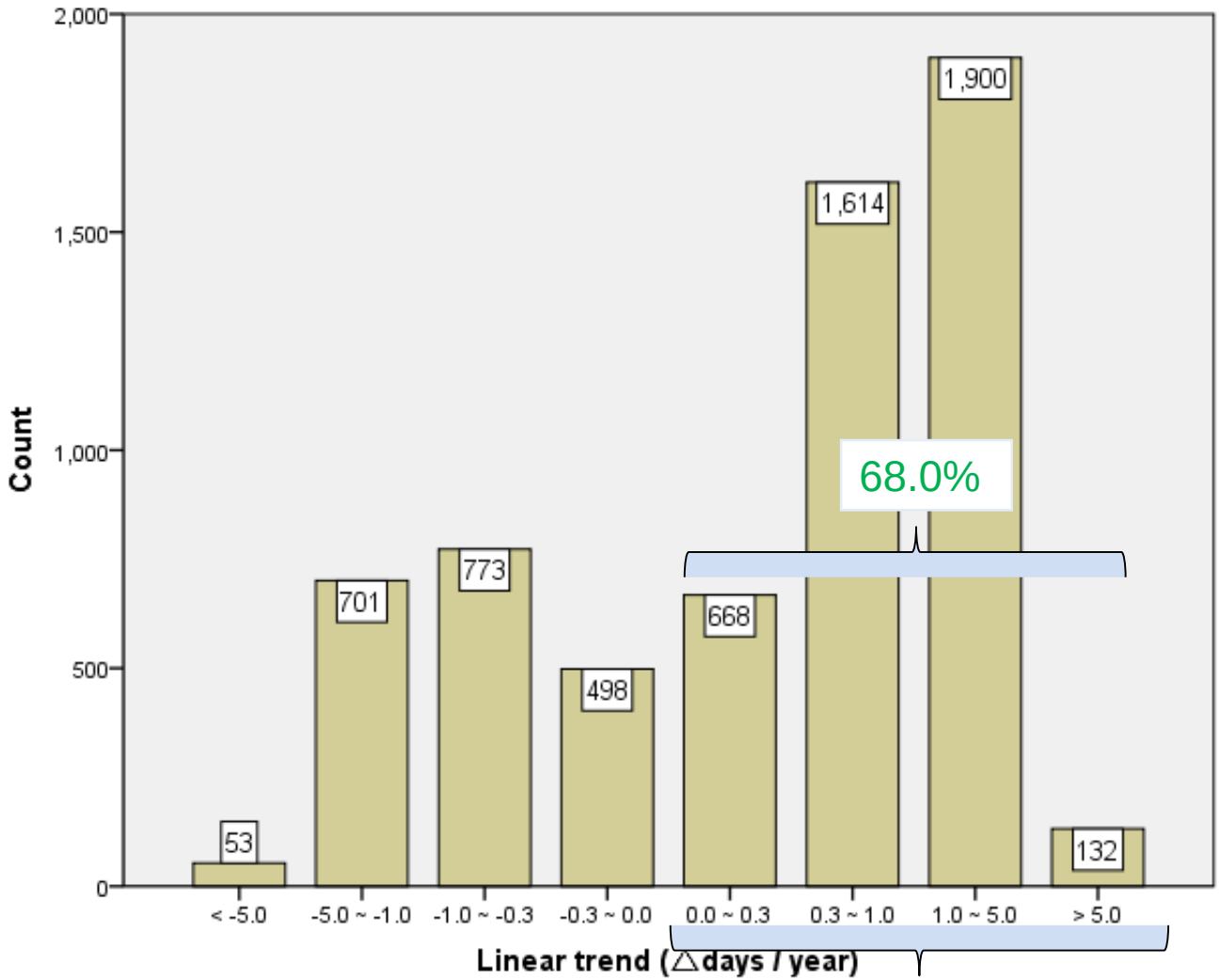
- Level 0 (Mean Wind Speed < 1 knot)



- Level 1 (1 ≤ Mean Wind Speed ≤ 3.5 knots)

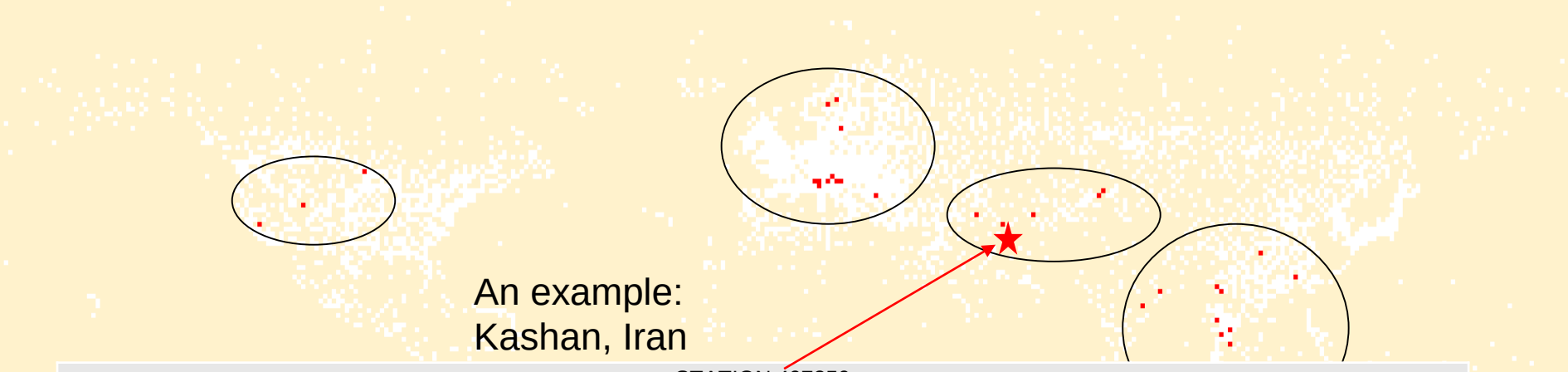


- Level 2 (3.5 < Mean Wind Speed ≤ 6.5 knots)



Distribution of Stations

with decreasing(<-5 days/year) level-0 wind days



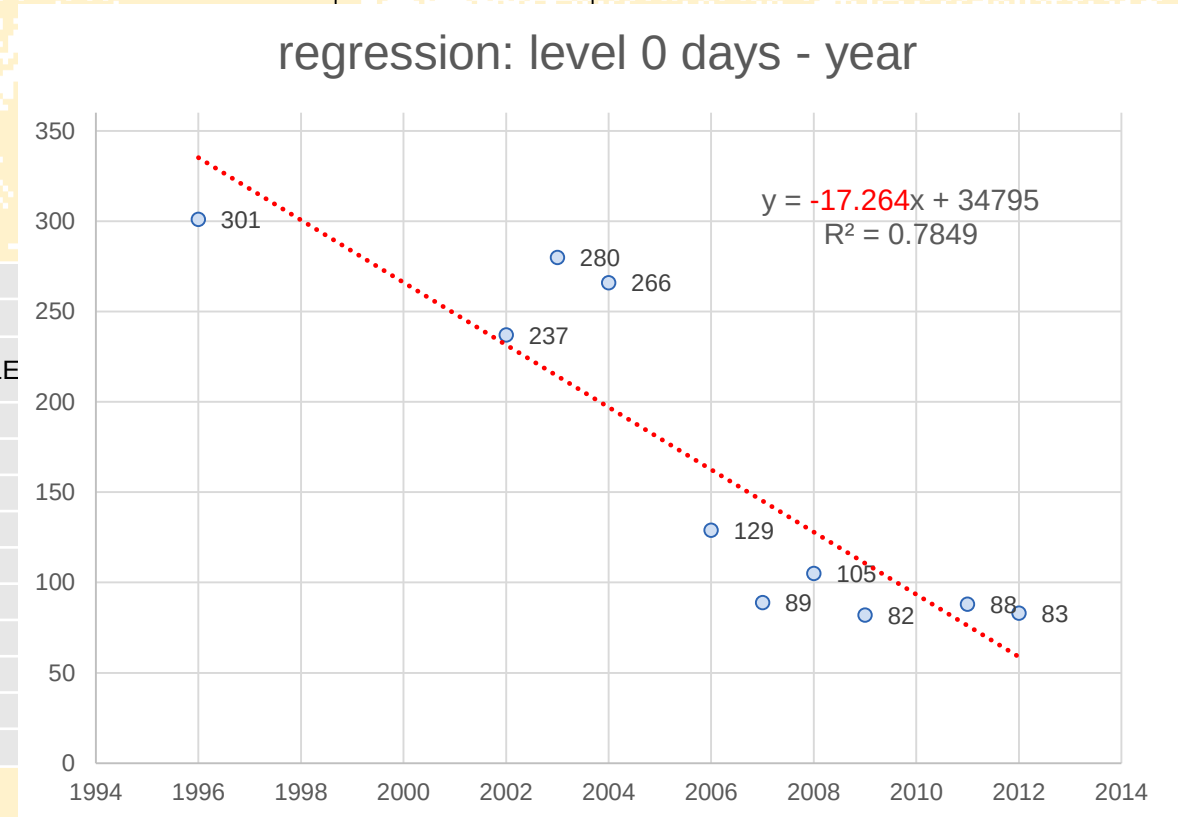
An example:
Kashan, Iran

STATION 407850														
YEAR	DAYS													
	LEVEL 0	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVEL 5	LEVEL 6	LEVEL 7	LEVEL 8	LEVEL 9	LEVEL 10	LEVEL 11	MISSING	TOTAL
1996	301	53	5	4	0	0	0	0	0	0	0	0	0	363
2002	237	104	17	3	2	0	0	0	0	0	0	0	0	363
2003	280	76	4	2	0	0	0	0	0	0	0	0	0	362
2004	266	80	13	2	1	0	0	0	0	0	0	0	0	362
2006	129	151	72	10	0	0	0	0	0	0	0	0	0	362
2007	89	183	81	12	0	0	0	0	0	0	0	0	0	365
2008	105	179	63	9	4	0	0	0	0	0	0	0	0	360
2009	82	180	77	19	1	1	0	0	0	0	0	0	0	360
2011	88	207	55	13	2	0	0	0	0	0	0	0	0	365
2012	83	182	76	20	5	0	0	0	0	0	0	0	0	366

Distribution of Stations

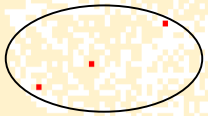
with decreasing(<-5 days/year) level-0 wind days

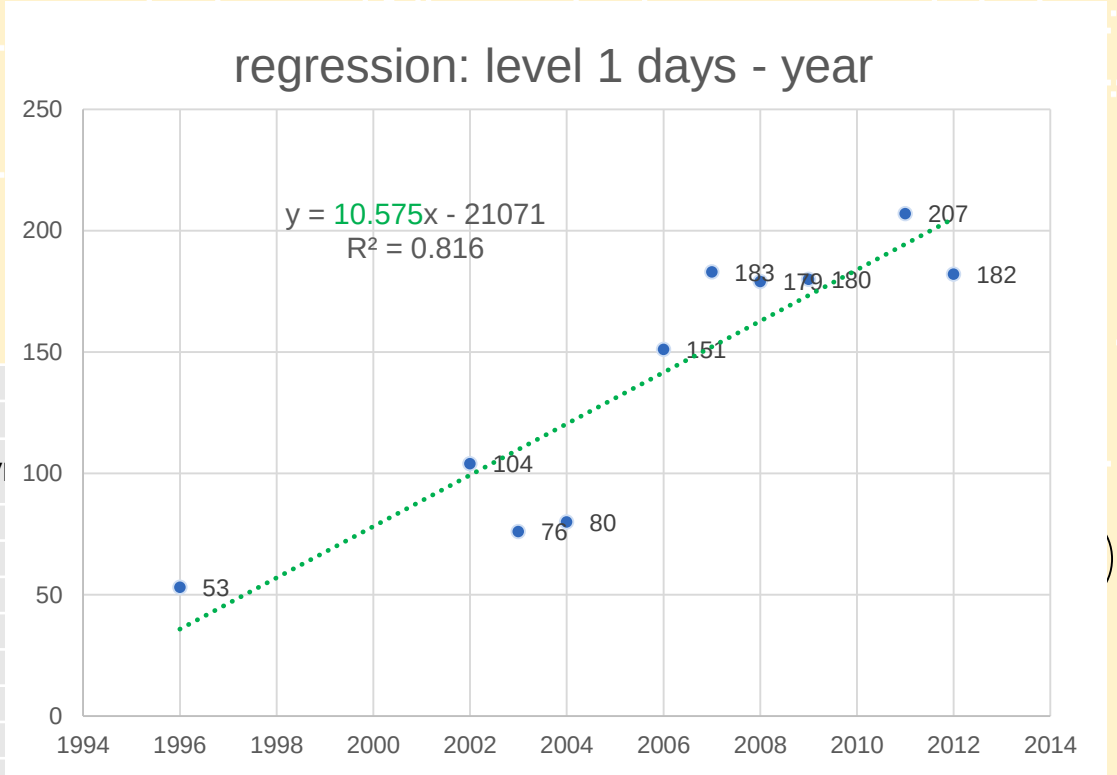
YEAR	LEVEL 0	LEVEL 1	LEVEL 2	LE	AL
1996	301	53	5		363
2002	237	104	17		363
2003	280	76	4		362
2004	266	80	13		362
2006	129	151	72		362
2007	89	183	81		365
2008	105	179	63		360
2009	82	180	77		360
2011	88	207	55		365
2012	83	182	76		366



Distribution of Stations

with decreasing(<-5 days/year) level-0 wind days

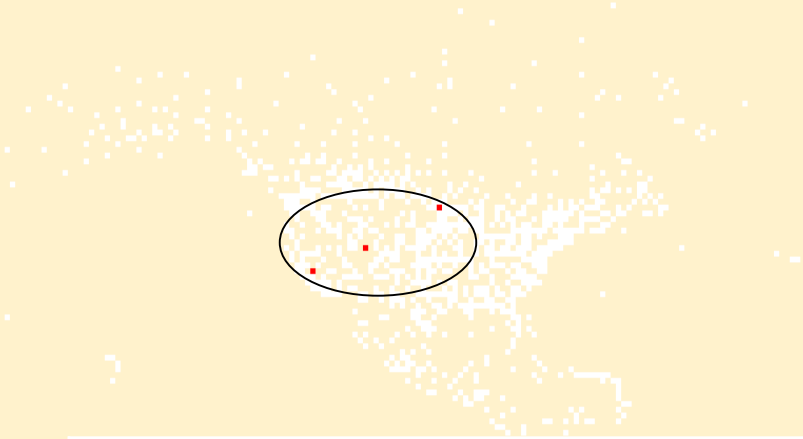


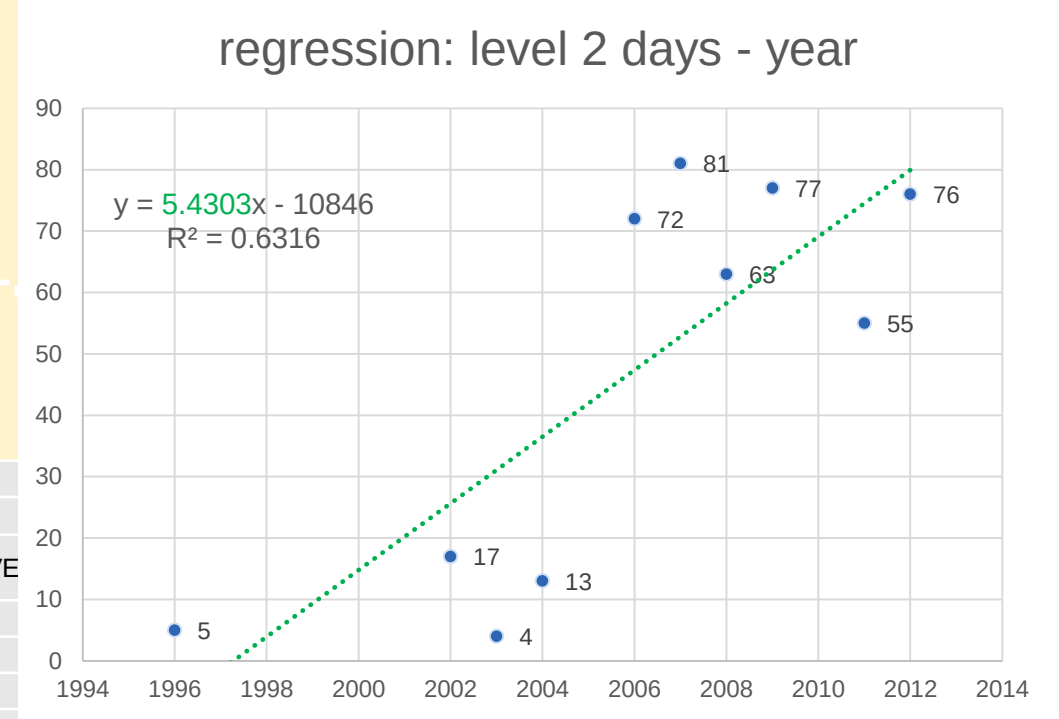


YEAR	LEVEL 0	LEVEL 1	LEVEL 2	LEVEL 3	LEV									
1996	301	53	5	4										
2002	237	104	17	3										
2003	280	76	4	2										
2004	266	80	13	2										
2006	129	151	72	10										
2007	89	183	81	12										
2008	105	179	63	9										
2009	82	180	77	19	1	1	0	0	0	0	0	0	0	360
2011	88	207	55	13	2	0	0	0	0	0	0	0	0	365
2012	83	182	76	20	5	0	0	0	0	0	0	0	0	366

Distribution of Stations

with decreasing(<-5 days/year) level-0 wind days





YEAR	LEVEL 0	LEVEL 1	LEVEL 2	LEVEL 3	LEVEL 4	LEVE								
1996	301	53	5	4	0									
2002	237	104	17	3	2									
2003	280	76	4	2	0									
2004	266	80	13	2	1	0	0	0	0	0	0	0	0	362
2006	129	151	72	10	0	0	0	0	0	0	0	0	0	362
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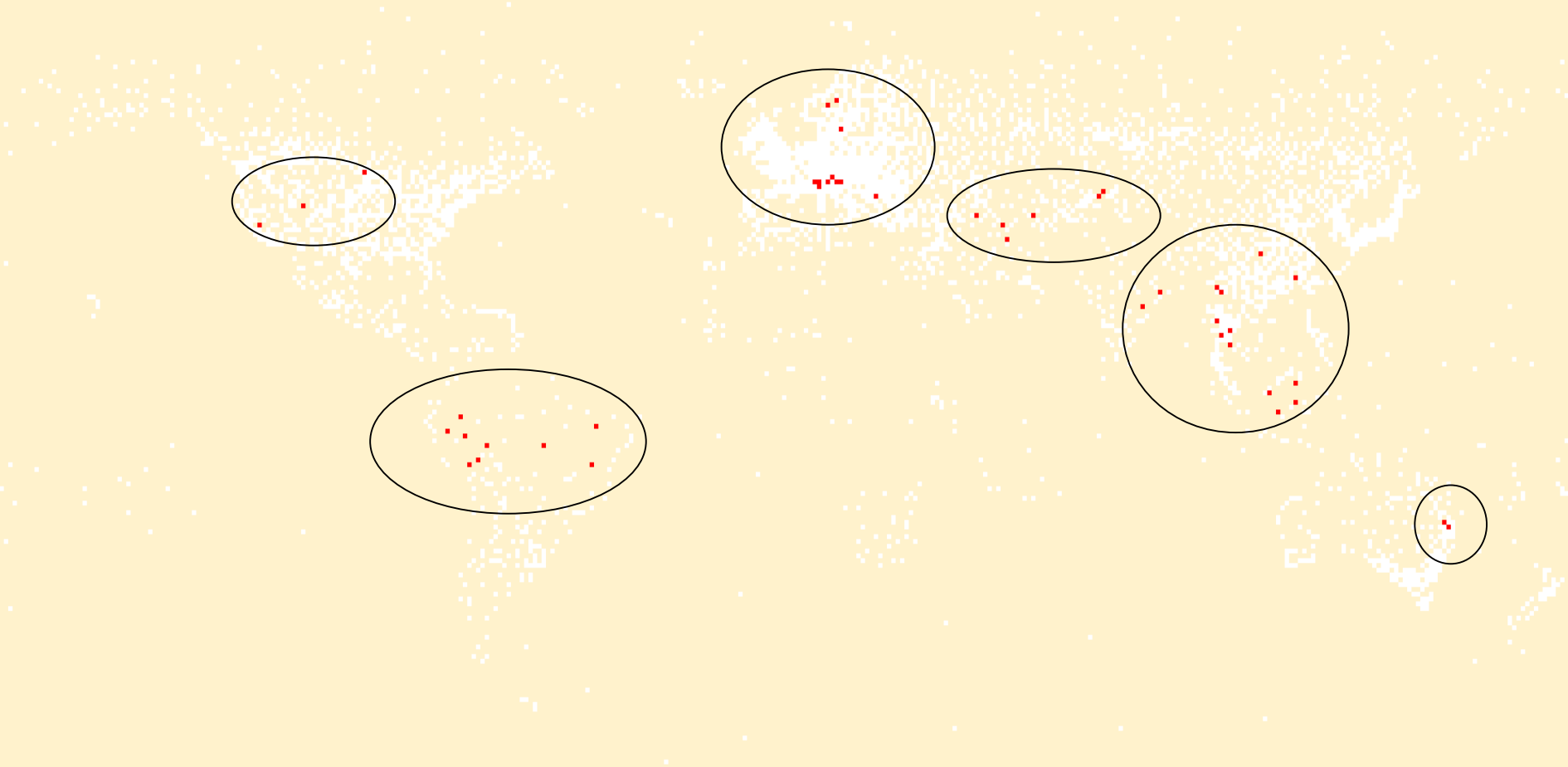
2008	105	179	63	9	4	0	0	0	0	0	0	0	0	360
2009	82	180	77	19	1	1	0	0	0	0	0	0	0	360
2011	88	207	55	13	2	0	0	0	0	0	0	0	0	365
2012	83	182	76	20	5	0	0	0	0	0	0	0	0	366

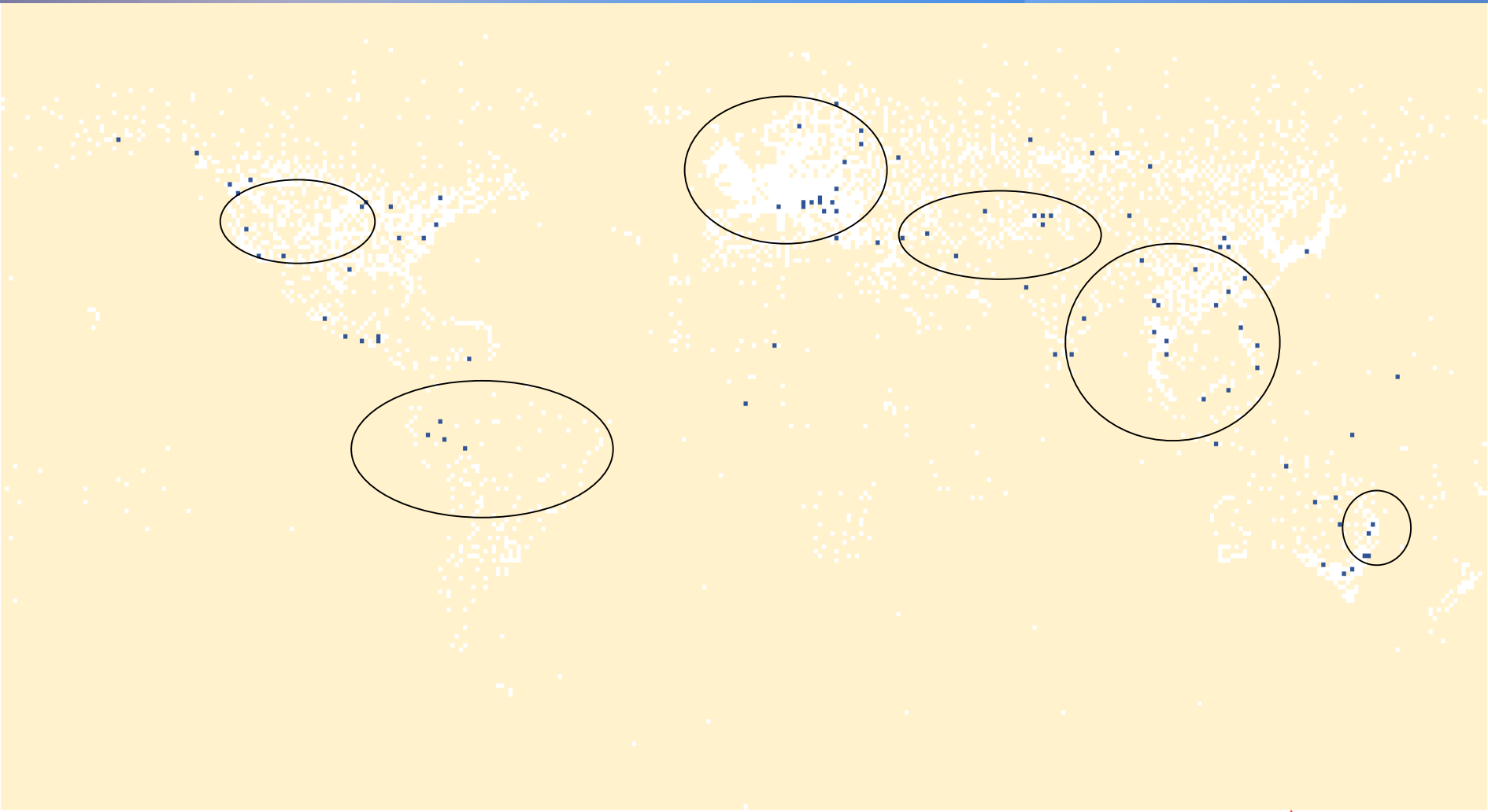
Distribution of Stations

with decreasing(<-5 days/year) level-0 wind days



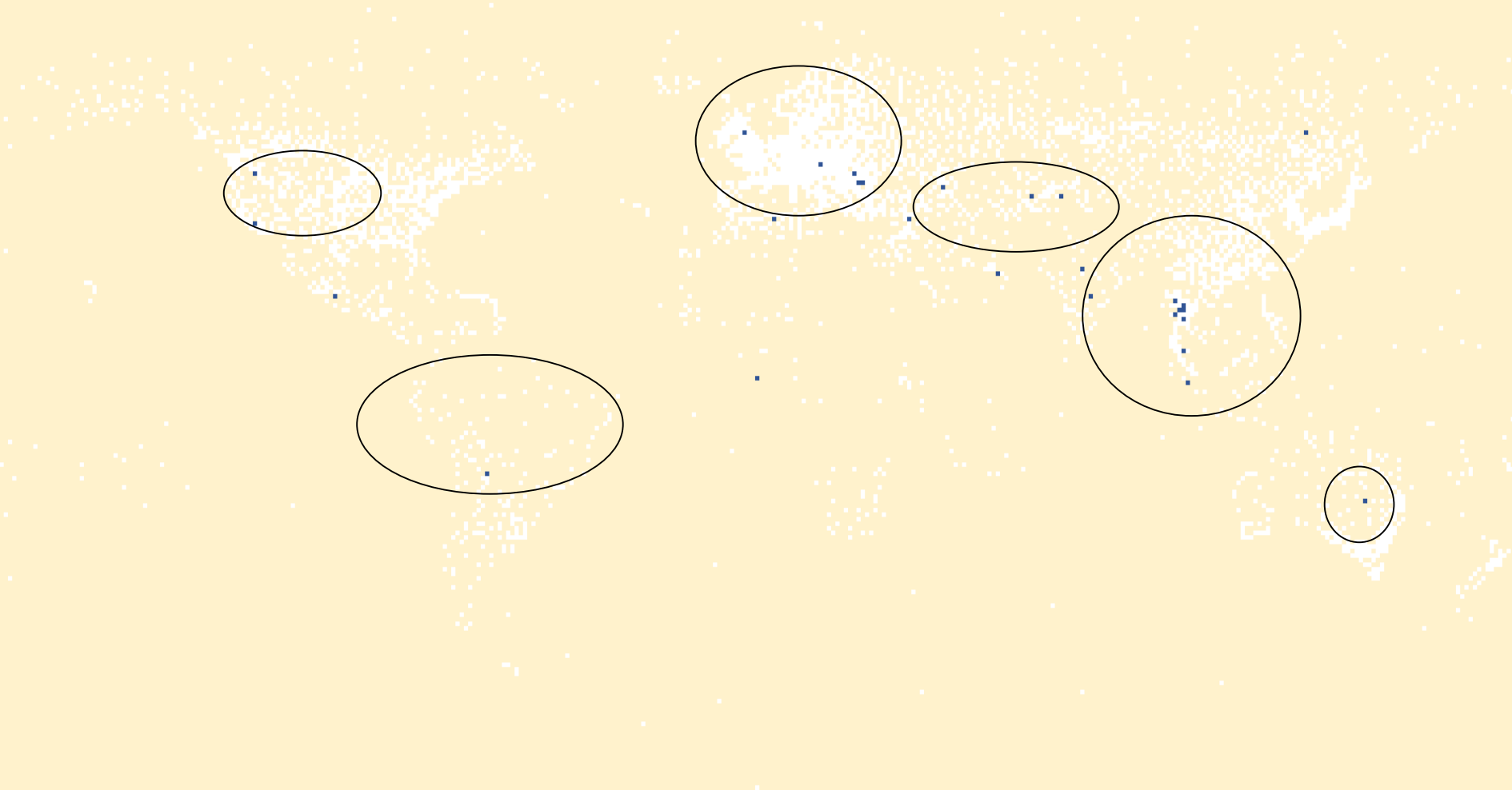
Distribution of Stations

with increasing (>5 days/year) level-1 wind days



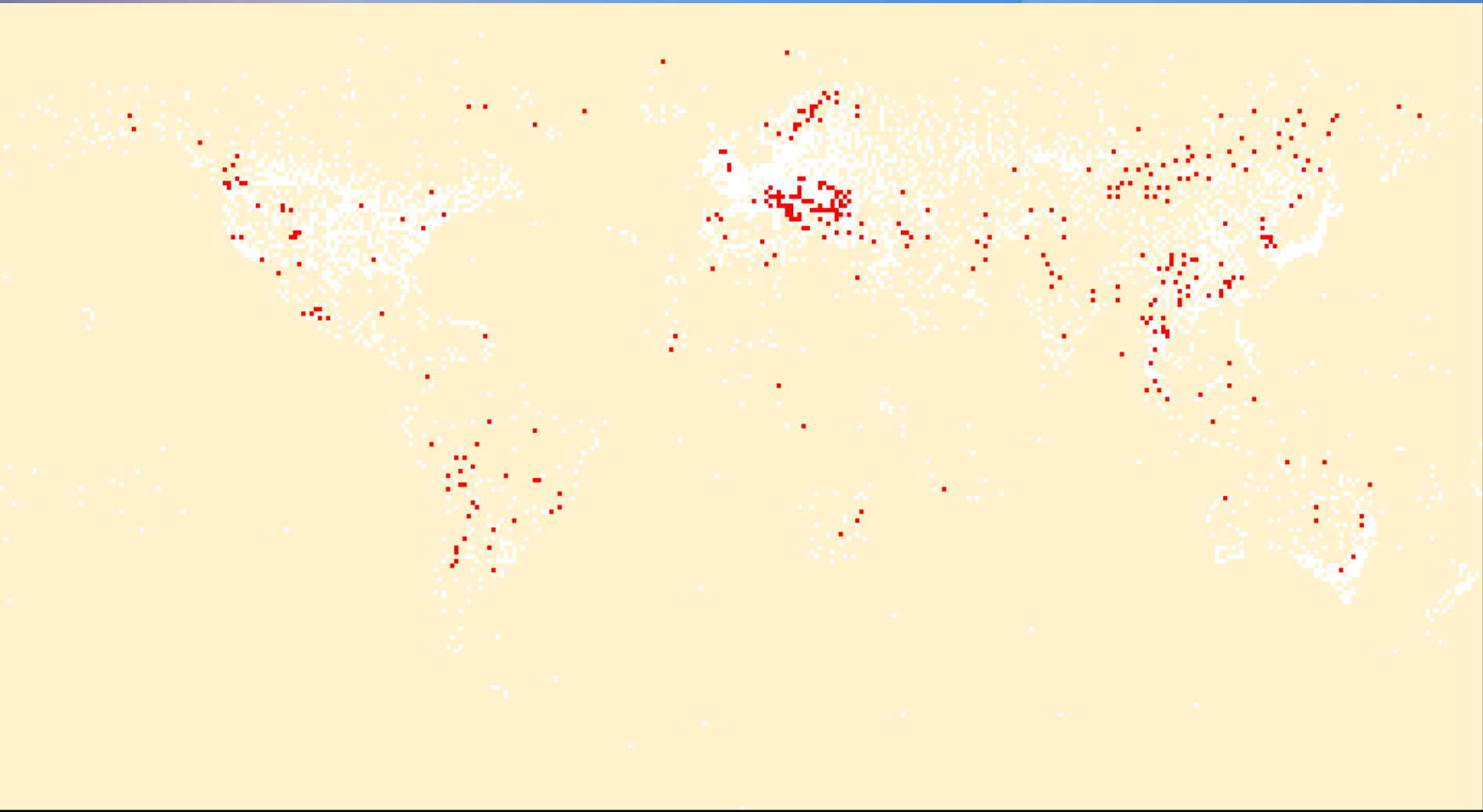
Distribution of Stations

with increasing (>5 days/year) level-2 wind days



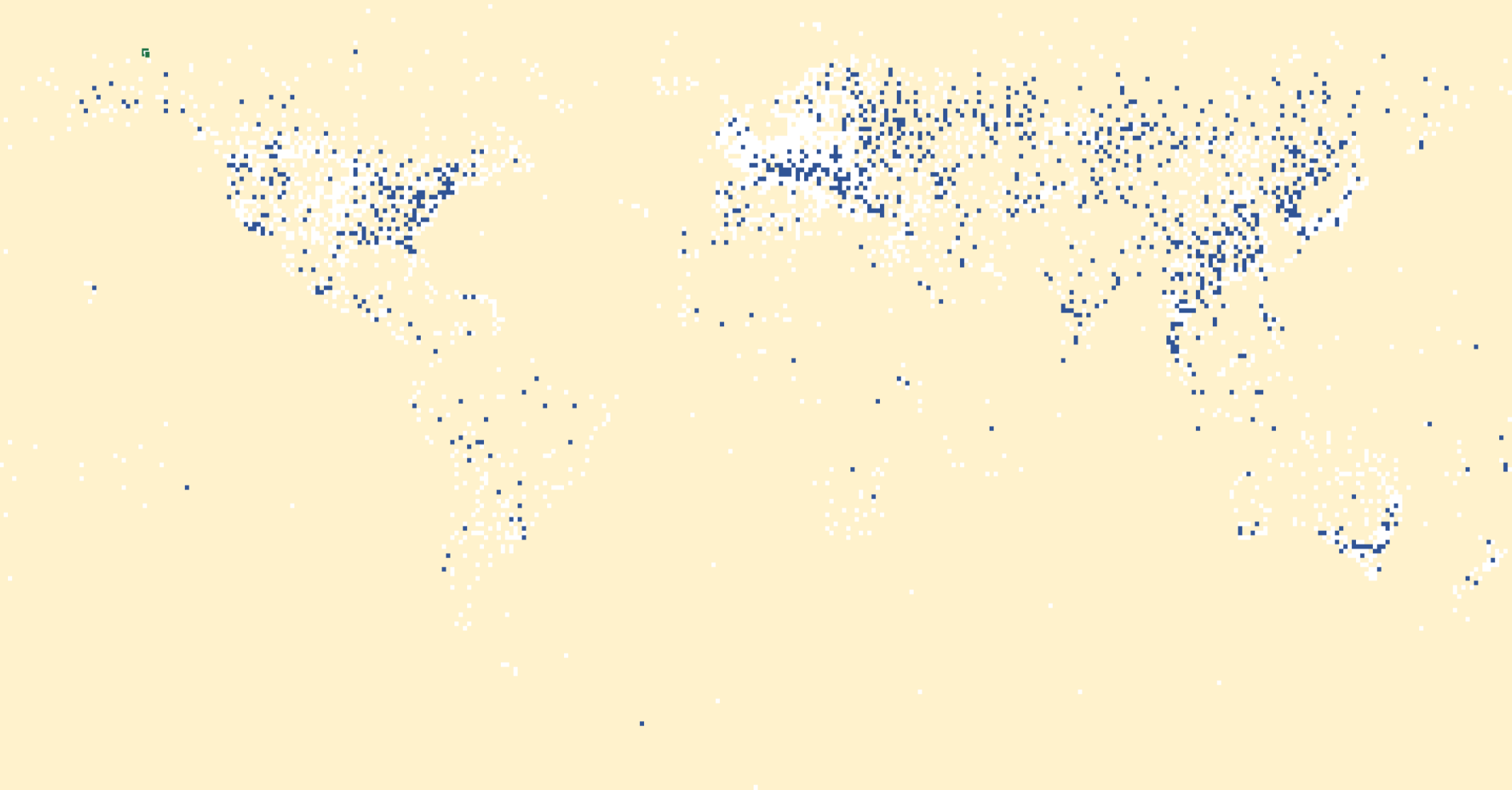
Distribution of Stations

with decreasing(-1~-5 days/year) level-0 wind days



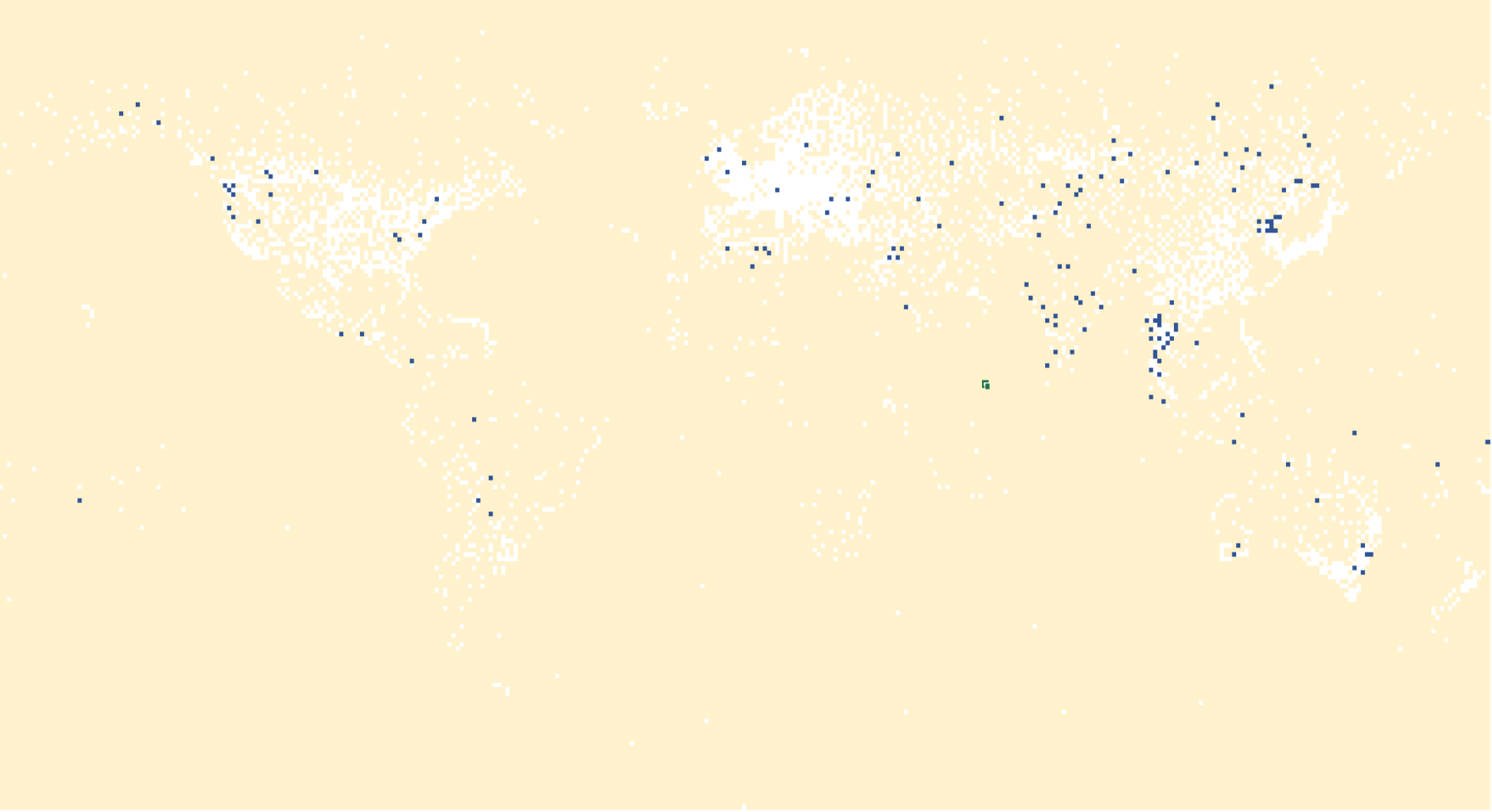
Distribution of Stations

with increasing (1~5 days/year) level-1 wind days

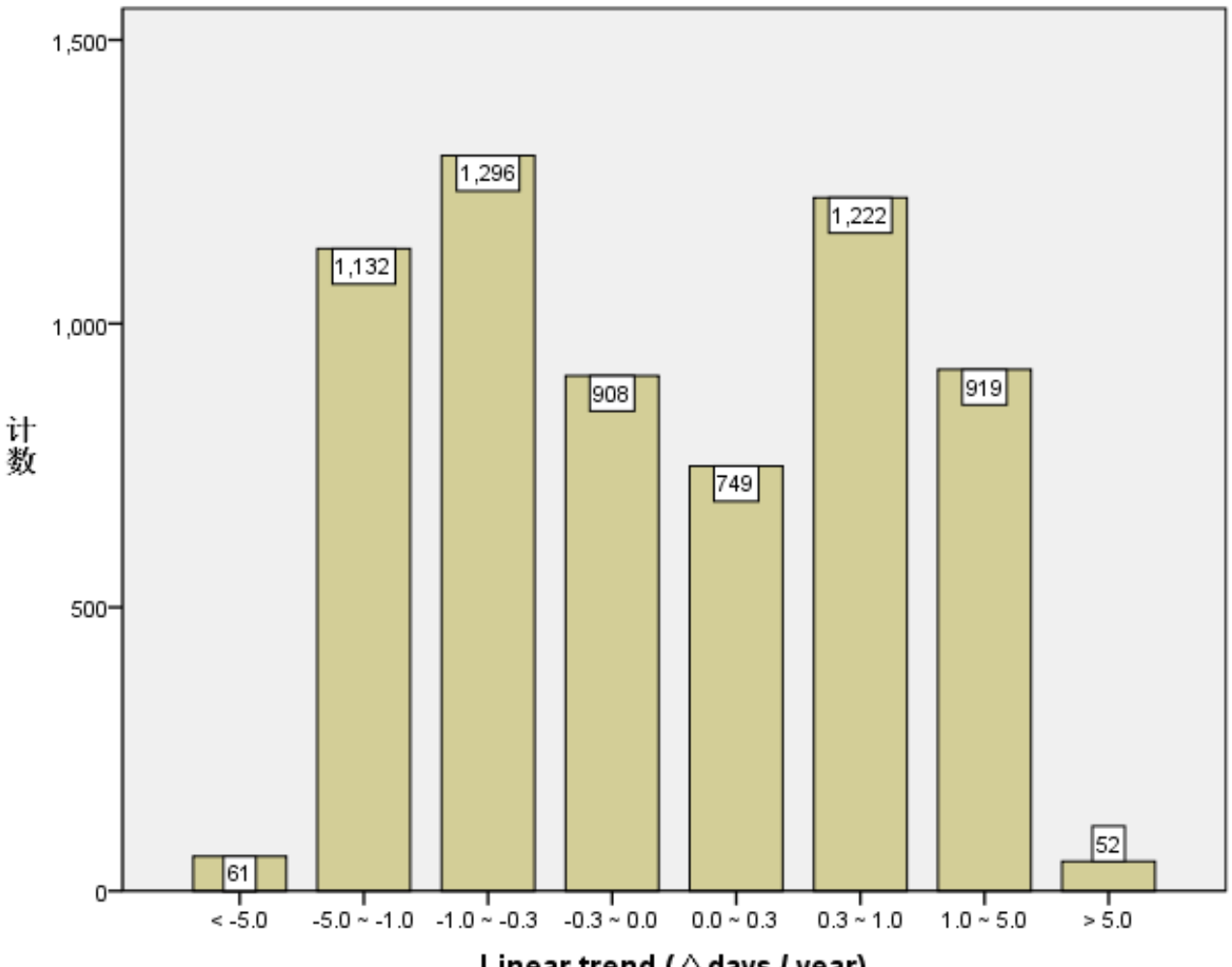


Distribution of Stations

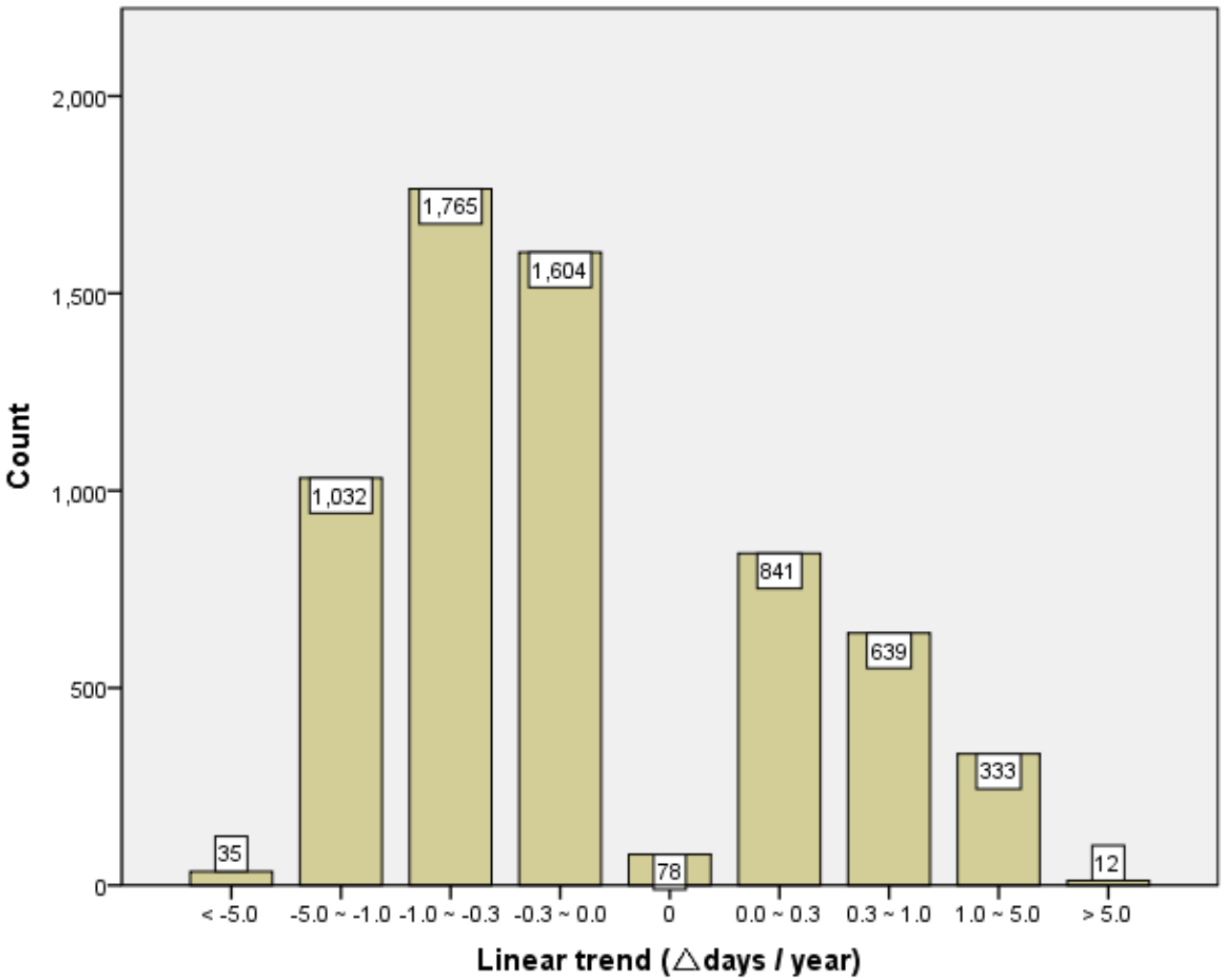
with increasing (1~5 days/year) level-2 wind days



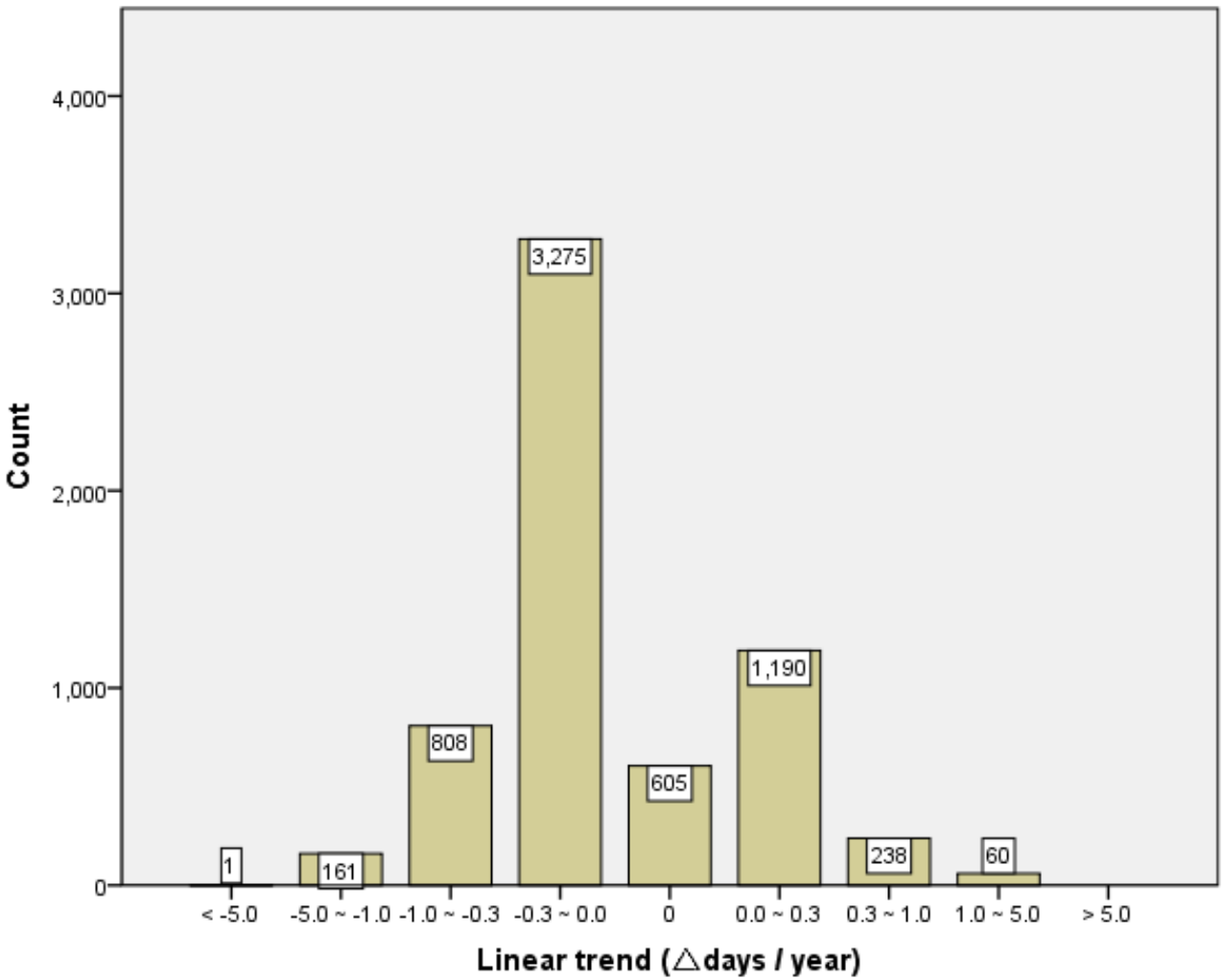
- Level 3 (6.5 < Mean Wind Speed ≤ 10.5 knots)



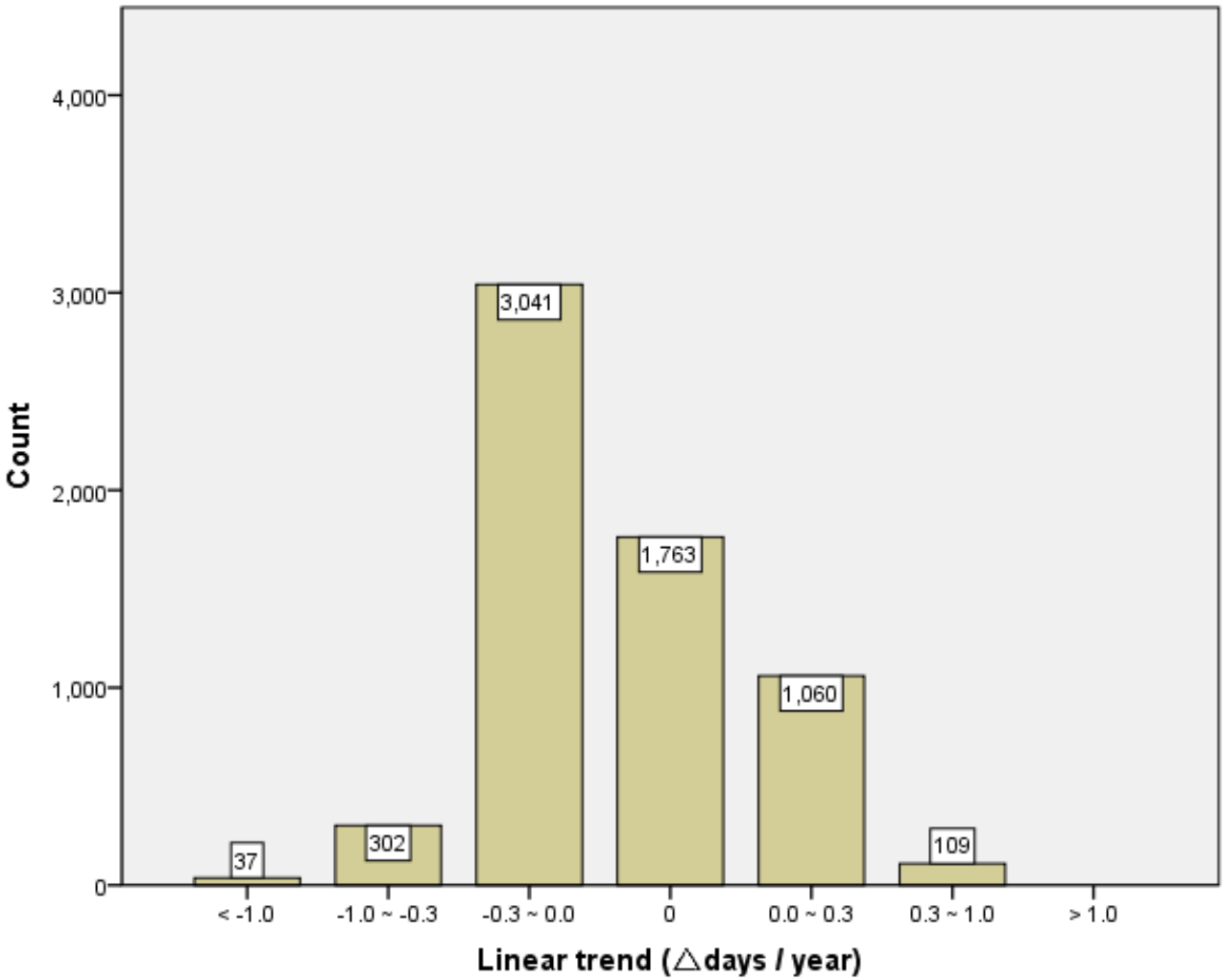
- Level 4 (10.5 < Mean Wind Speed ≤ 16.5)



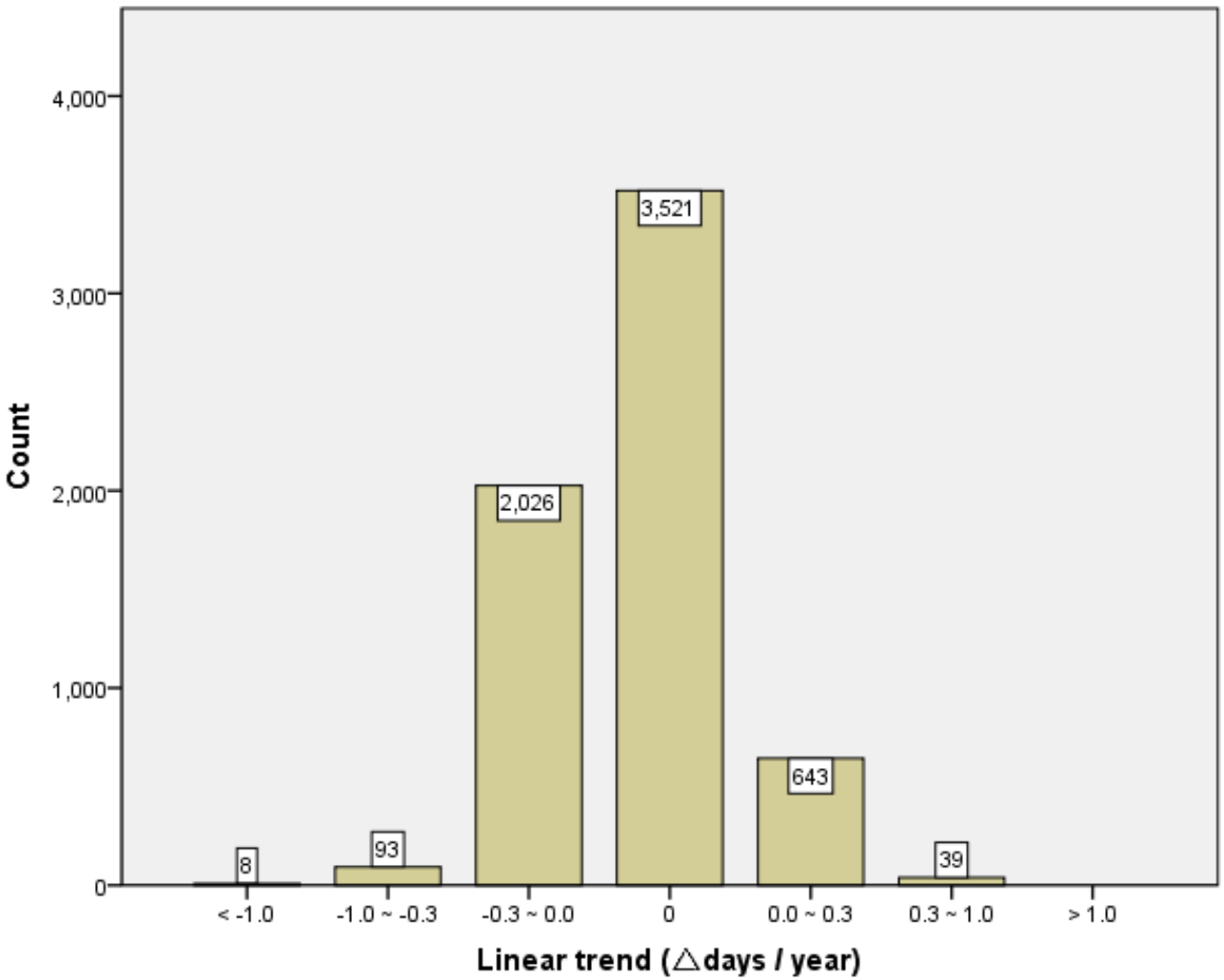
- Level 5 (16.5 < Mean Wind Speed ≤ 21.5)



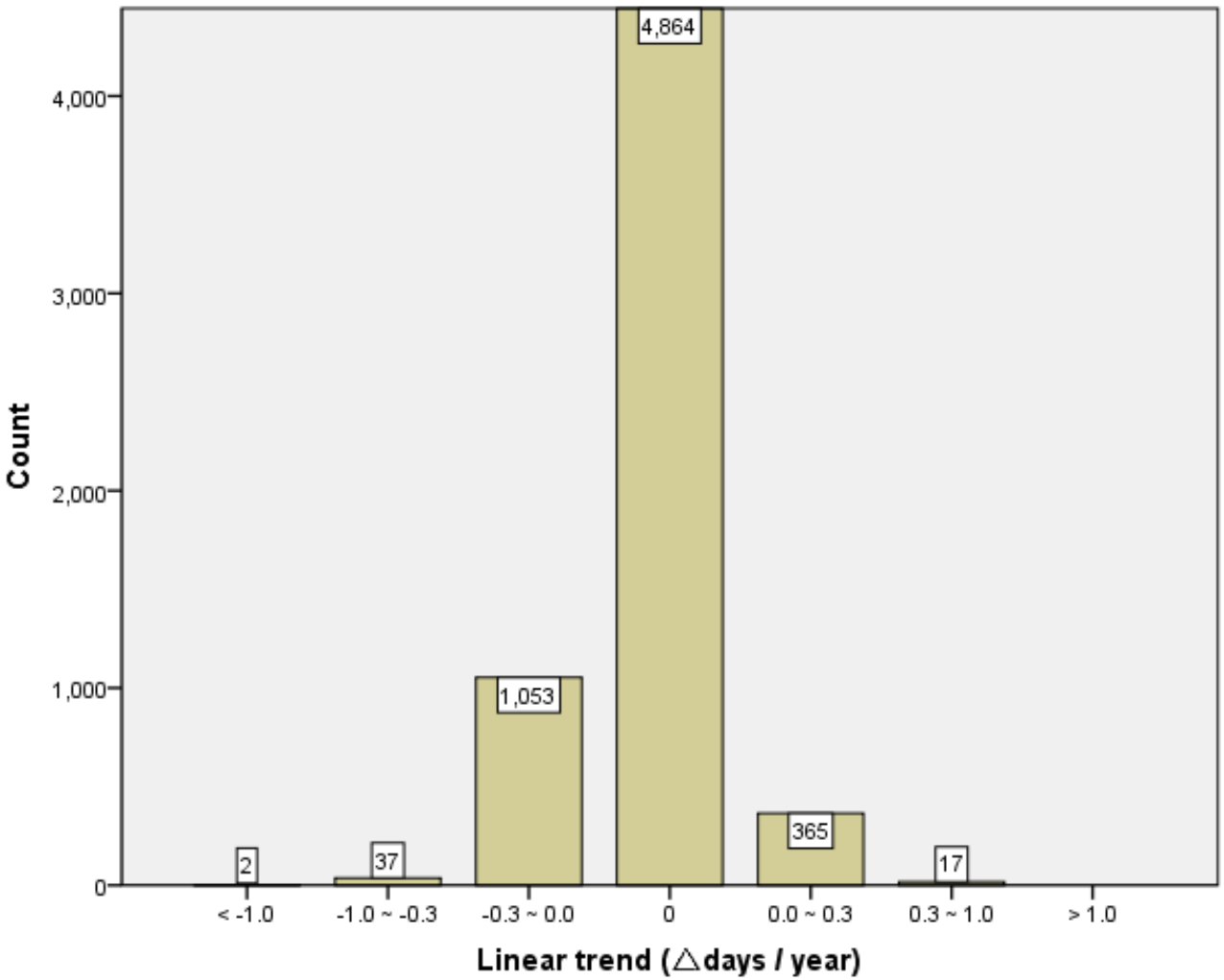
- Level 6 (21.5 < Mean Wind Speed ≤ 27.5)



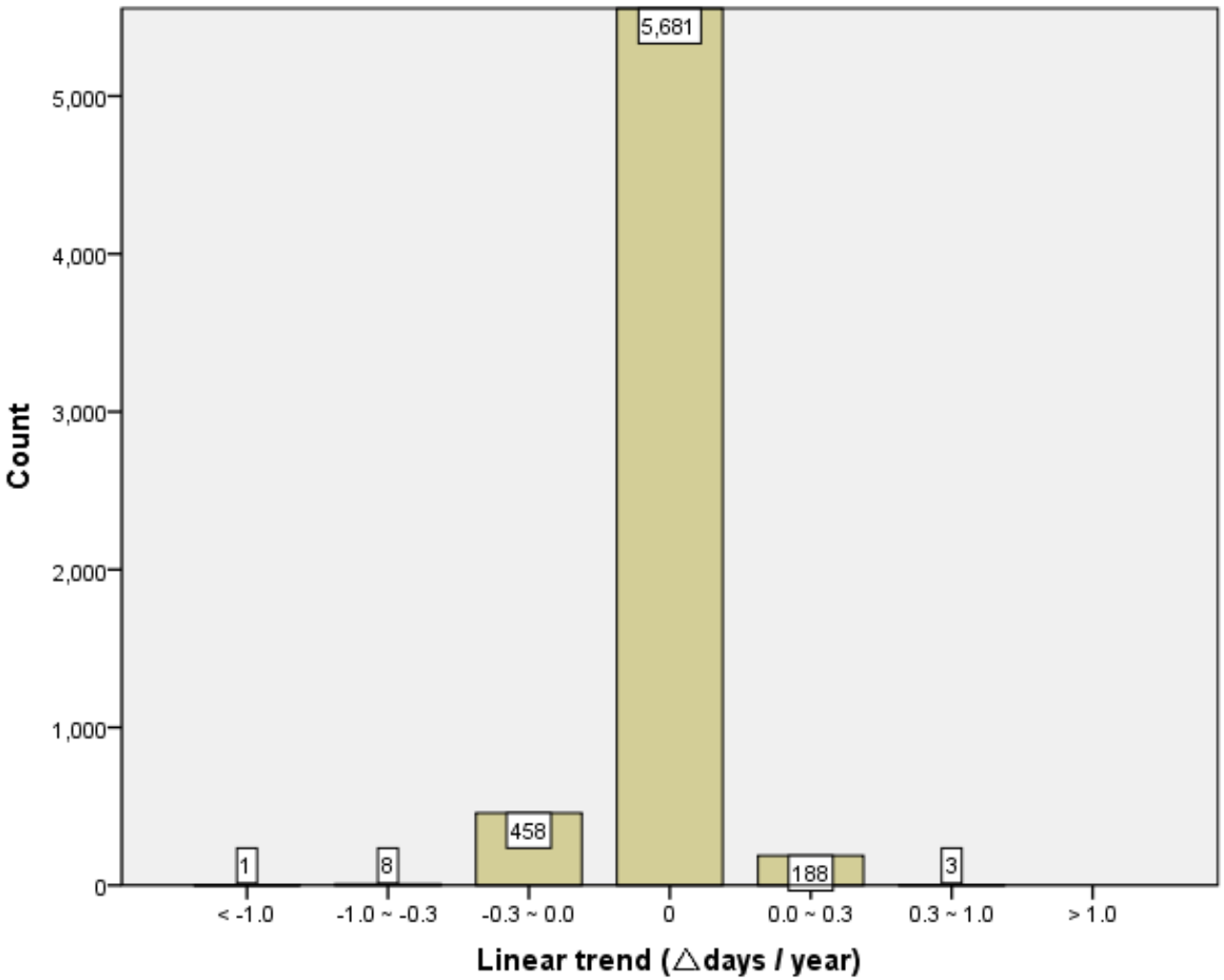
- Level 7 (27.5 < Mean Wind Speed ≤ 33.5)



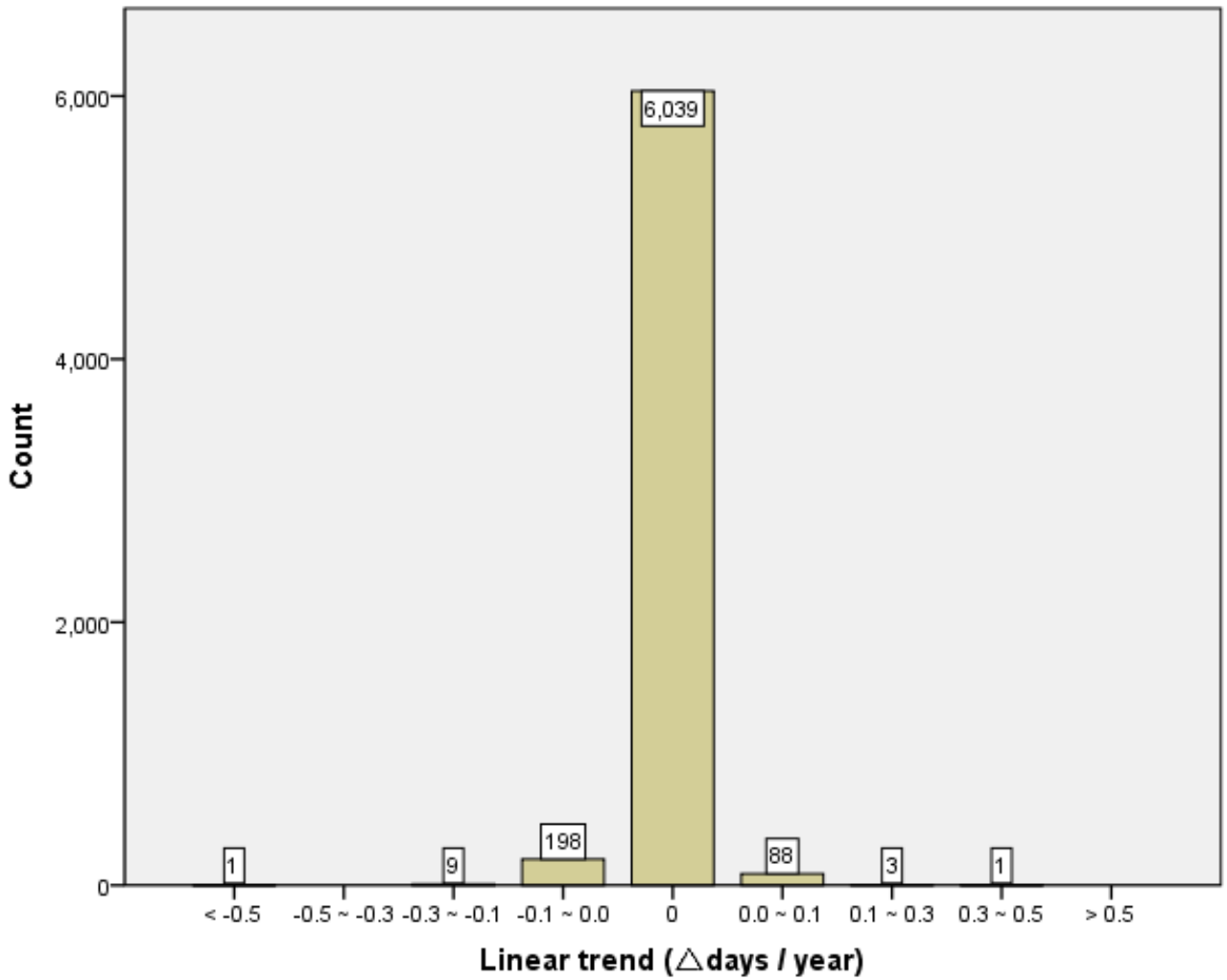
- Level 8 (33.5 < Mean Wind Speed ≤ 40.5)



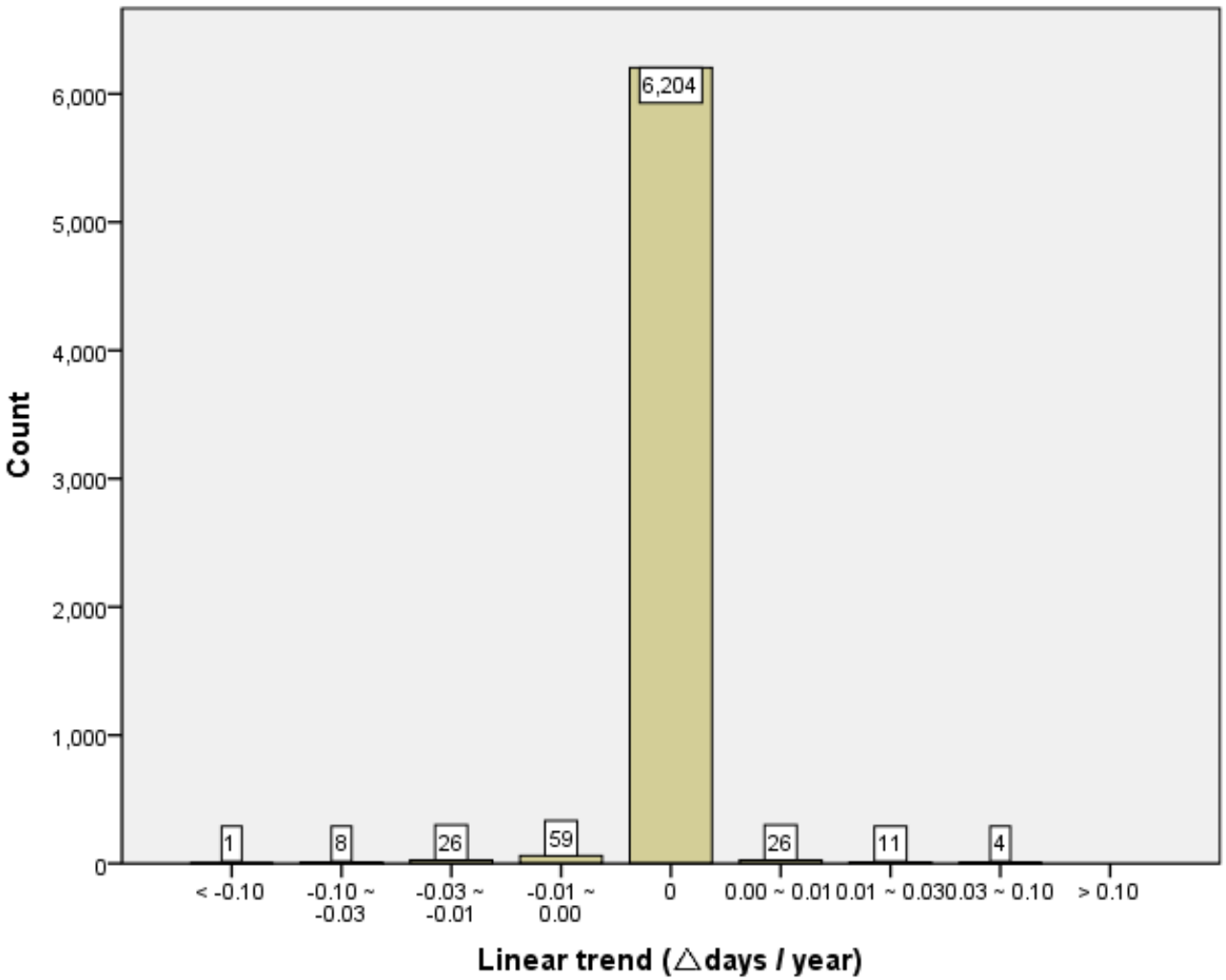
- Level 9 (40.5 < Mean Wind Speed ≤ 47.5)



- Level 10 (47.5 < Mean Wind Speed ≤ 55.5)



- Level 11 (Mean Wind Speed ≥55.5)



Discussion

- Days of level-0 wind decreases.
- Levels 1 and 2: increase.
- Levels 3 ~ 11: decrease.

Thank you!