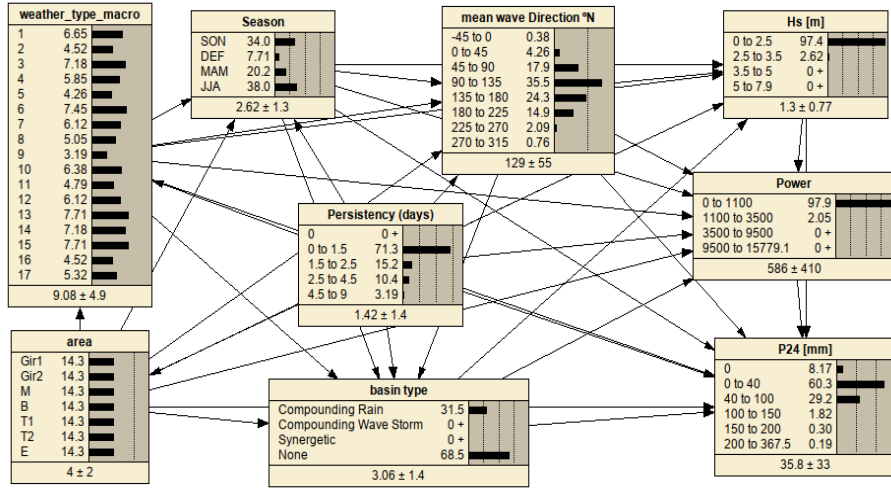
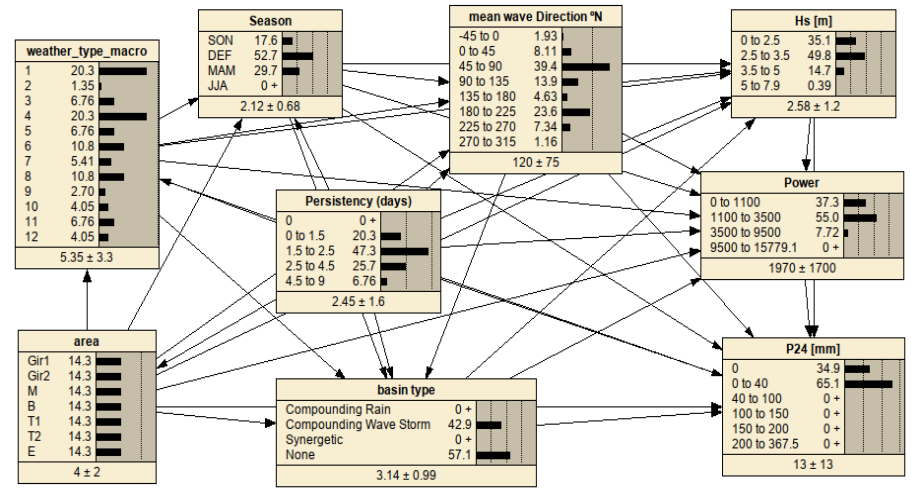
Figure S0. BNs for the solo rain (SR) and solo wave (SW) events

SR

SW

Figure S1. Annual frequency (a), monthly frequency (b), average monthly magnitudes of individual and compound events (c) and, average monthly number of affected basins (d) for the different coastal sectors

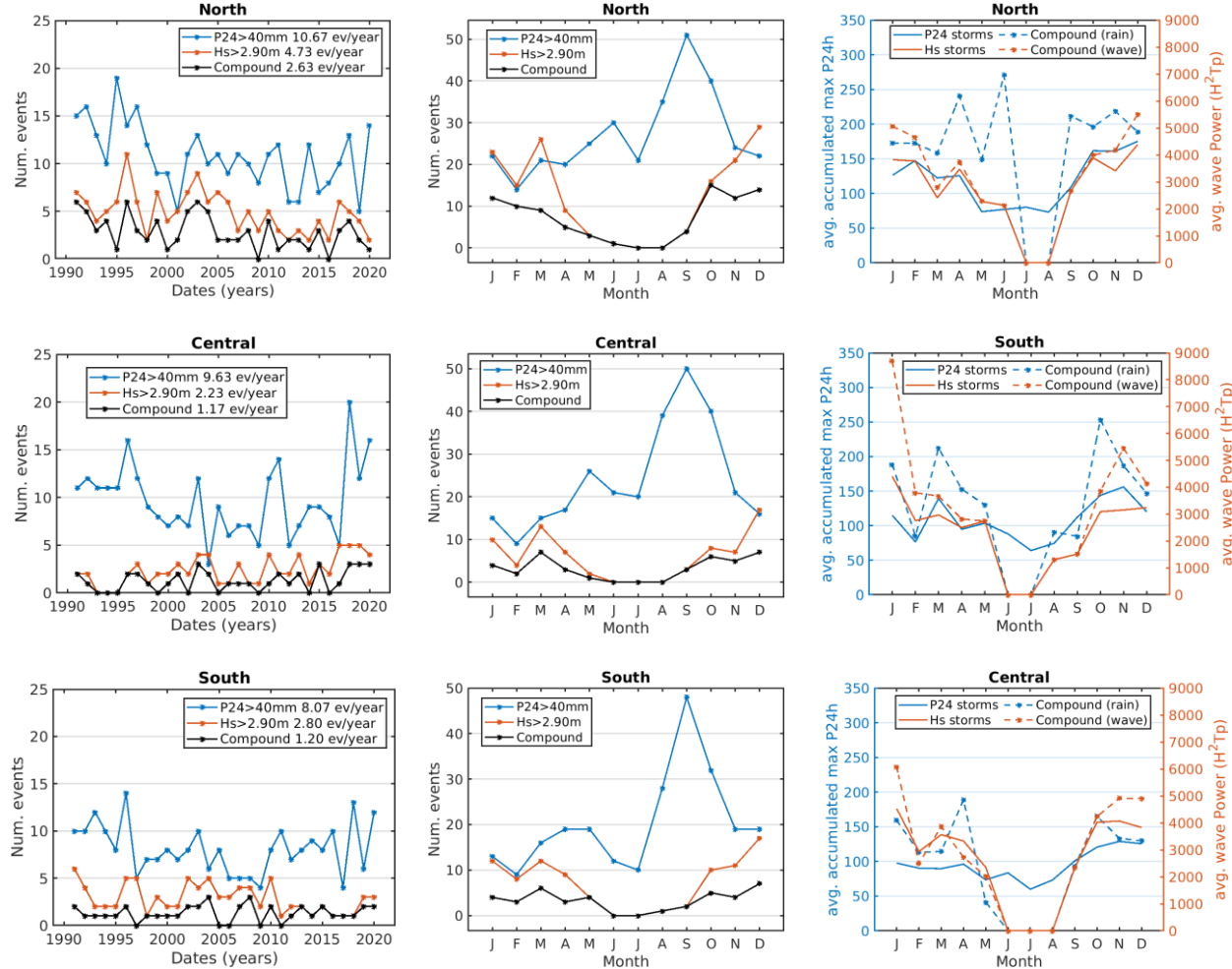



Table S1. Compound (C) SWP description and probabilities of occurrence conditioned to event intensities. Colour scale ranges from light to dark according to quantiles relative to the maximum value in each column. Blue colours represent probabilities of occurrence calculated over the respective number of events (without specific conditions); red scale colours represent BN probabilities conditioned to different thresholds of P24 and wave power and calculated considering their cumulative occurrence in all basins

	Synoptic pattern	n°days	P(SWP) n/N	1-P(SWP|P24≥100mm)	P(SWP|P24≥200mm)	P(SWP|C≥IV)	2-P(SWP|C≥II + Hs ≥ 3.5 m)	P(SWP|1+2 Multivar.)	Long Name	Surface low-pressure location	Surface high-pressure location	500-mb through	500-mb ridge	Prevailing wind direction	Seasonality
Atlantic low	SWP1c-NWPL	6	5,4 %	4,4 %	0,0 %	0,0 %	3,9 %	3,2 %	NW Peninsula Low	NW Iberian Peninsula	North Africa to North Europe	NE Atlantic to Iberian Peninsula	Mediterranean Sea to Iceland	SE	Late Autumn + Winter
	SWP9c-AL	16	14,3 %	11,1 %	0,0 %	0,0 %	5,2 %	0,0 %	Atlantic Low	North Atlantic	Azores islands to NE Europe	Iceland to NW Iberian Peninsula	Azores islands - Mediterranean Sea -Central Europe	SE-S	Cold part of the year
Cut-off	**SWP2c-SPC**	**12**	**10,7 %**	**11,1 %**	**16,7 %**	**40,0 %**	**13,5 %**	**25,8 %**	**South Peninsula Cut-Off**	S-SE Iberian Peninsula	British Islands to Central Europe	**	Atlantic to NE Africa	NE	August + November + Winter + Early Spring
	SWP3c-sSEPC	7	6,3 %	3,3 %	0,0 %	0,0 %	0,0 %	0,0 %	shallow SE Peninsula Cut-Off	SE Iberian Peninsula	Azores Islands to Central Europe	**	North Africa to Central Europe	E	Autumn + February + May
	SWP6c-SEPC	**7**	**6,3 %**	**8,9 %**	**0,0 %**	**20,0 %**	**12,3 %**	**6,5 %**	**SE Peninsula Cut-Off**	SE Iberian Peninsula	Azores Islands to Central Europe	**	North Africa to Northern Europe	NE	Late Autumn + Winter
	SWP10c-IPC	**8**	**7,1 %**	**13,3 %**	**16,7 %**	**0,0 %**	**7,1 %**	**3,2 %**	**Iberian Peninsula Cut-Off**	SE Iberian Peninsula	Azores Islands to Central Europe	**	Azores Islands to Central Europe	E	Late Autumn + December + Spring
	SWP13c-sNPC	5	4,5 %	11,1 %	8,3 %	0,0 %	0,0 %	0,0 %	shallow North Iberian Peninsula C-O	SE Iberian Peninsula	Azores Islands to Mediterranean Sea	**	Azores Islands to NE Africa	E	Autumn + Winter + Early Spring
	SWP14c-NPC	**10**	**8,9 %**	**13,3 %**	**33,3 %**	**8,6 %**	**10,3 %**	**16,1 %**	**North Iberian Peninsula C-O**	SE Iberian Peninsula	Atlantic to British Islands	**	Atlantic to NE Africa	NE-E	Late Autumn + Early Spring + January
	SWPc15c-CSC	2	1,8 %	3,3 %	0,0 %	0,0 %	0,0 %	0,0 %	Cantabric Sea Cut-Off	Mediterranean Sea	W Iberian Pensinsula to British Islands	**	NE Africa to South Europe	N-NE	Late Spring
	SWP17c-sSPC	2	1,8 %	3,3 %	0,0 %	0,0 %	1,3 %	3,2 %	shallow South Iberian Peninsula Cut-Off	S Iberian Peninsula to N Africa	British Islands to Central Europe	**	**	E-NE	December
	SWP18c-SWPC	6	5,4 %	0,0 %	0,0 %	0,0 %	5,8 %	0,0 %	South West Iberian Peninsula Cut-Off	SW Iberian Peninsula	British Islands to Central Europe	**	British Islands to NE Africa	E-NE	September to March
Trough	**SWP4c-WET**	**6**	**5,4 %**	**2,2 %**	**16,7 %**	**0,0 %**	**5,8 %**	**3,2 %**	**Western Europe Through**	Iberian Peninsula	Atlantic sea	British Islands to Iberian Peninsula	Atlantic Ridge + Mediterranean Ridge	E	Autumn + Spring
	SWP5c-CET	5	4,5 %	1,1 %	0,0 %	0,0 %	2,6 %	3,2 %	Central Europe Through	Mediterranean Sea	North Atlantic Sea	Central-North Europe to Iberian Peninsula	Atlantic Ridge + Mediterranean Ridge	N	Winter + Spring
	SWP7c-CST	1	0,9 %	0,0 %	0,0 %	0,0 %	0,0 %	0,0 %	Cantabric Sea Through	NW Mediterranean	Azores islands	British Islands to NW Mediterr.	Azores Islands to NE Africa	NW-NE	December
	SWP8c-NMT	**6**	**5,4 %**	**4,4 %**	**8,3 %**	**11,4 %**	**11,0 %**	**9,7 %**	**North Mediterranean Through**	Mediterranean Sea	North Sea	Western Europe to NW Mediterr.	NE Africa to North Europe	NE	September + Winter
	SWP11c-AT	**2**	**1,8 %**	**3,3 %**	**0,0 %**	**5,7 %**	**3,9 %**	**9,7 %**	**Atlantic Through**	W Iberian Peninsula	North Africa to Central Europe	NE Atlantic to Iberian Peninsula	NE Africa to British Islands	E-SE	Winter
	SWP12c-IPT	8	7,1 %	1,1 %	0,0 %	0,0 %	5,2 %	3,2 %	Iberian Peninsula Through	NW Iberian Peninsula	Azores islands	Iceland to British Islands to Iberian Peninsula	Azores Islands to NE Africa	S-SE	Winter + Early spring + October
	SWP16c-EET	**3**	**2,7 %**	**4,4 %**	**0,0 %**	**14,3 %**	**12,3 %**	**12,9 %**	**Eastern Europe Through**	E Iberian Peninsula	North Sea to Central Europe	North Western Europe to NW. Mediterranean	Azores Islands to British Islands and N to NE Africa	NE	October + March

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Table S2. Solo Wave (SW) SWP description and probabilities of occurrence conditioned to event intensitiesColour scale ranges from light to dark according to quantiles relative to the maximum value in each column. Blue colours represent probabilities of occurrence calculated over the respective number of events (without specific conditions); red scale colours represent BN probabilities conditioned to different thresholds of P24 and wave power and calculated considering their cumulative occurrence in all basins

	Synoptic pattern	nºdays	P(SWP) n/N	P(SWP| C≥II)	P(SWP| C≥II+ Hs>3.5)	Long Name	Surface low-pressure location	Surface high-pressure location	500-mb through	500-mb ridge	Prevailing wind direction	Seasonality
Atlantic low	SWP4w-AL	15	20,3%	17,5 %	30,4 %	**Atlantic Low**	Atlantic to British Islands	S Azores Islands	Atlantic to Cantabric Sea	Azores Islands to N Africa	SW	Cold part of the year
	SWP9w-NSL	2	2,7 %	0,0 %	0,0 %	North Sea Low	North Sea and British Islands	Central to NW Africa	North Sea to Azore Islands	North Africa	SW	December + March
Cut-off	SWP5w-SWPC	5	6,8 %	5,0 %	8,7 %	NW Peninsula Cut-Off	NW Peninsula	Scandinavian Peninsula	**	North Africa to Mediterranean Sea	E-SE	Late Autumn + Late Winter to Early Spring
	SWP10w-EMC	3	4,1 %	10,0 %	17,4 %	**E Mediterranean Cut-Off**	Atlantic and W Scandinavian Peninsula	British Islands	**	British Islands and Azores Islands to N Africa	NE	December + April
	SWP11w-NMC	5	6,8 %	5,0 %	0,0 %	Gulf of Lion Cut-Off	Mediterranean Sea and W Europe	Atlantic	**	Atlantic to NE Africa	N	November + January + April
	SWP12c-SEPC	3	4,1 %	5,0 %	8,7 %	SE Peninsula Cut-Off	North Sea and Mediterranean Sea	Azores Islands and SW Europe	**	Azores Islands to SW Europe	N-NE	November + February
Trough	SWP1w-NMT	15	20,3 %	27,5 %	0,0 %	N Mediterranean Through	Mediterranean Sea	British Islands	Scandinavian Peninsula to NW Mediterranean	Atlantic to W Mediterranean Sea	N	Cold part of the year
	SWP2w-NWET	1	1,4 %	5,0 %	8,7 %	NW Europe Through	Central and NW Europe	Atlantic	Central Europe to NW Mediterranean	British Islands to Azores Islands to N Africa	N-NW	November
	SWP3w-WET	5	6,8 %	0,0 %	0,0 %	W European Through	NW Europe	Atlantic	NW Europe to NW Mediterranean	Atlantic to N Africa	NW	Cold part of the year
	SWPw6-NST	8	10,8 %	0,0 %	0,0 %	North Sea Through	North Sea	Azores Islands	North Sea to NW Mediterranean	Azores Islands to N Africa	W	Cold part of the year
	SWP7w-ET	4	5,4 %	10,0 %	17,4 %	**European Through**	W Scandinavian Peninsula	Iceland	NW Europe to Iberian Peninsula	Iceland and S Azores Islands to N Africa	NE	December to March
	SWP8w-EMT	8	10,8 %	15,0 %	8,7 %	E Mediterranean Through	SW Iceland	N Europe	East Europe to Mediterranean	Scandinavian Peninsula to N Africa to Azores Islands	E	January to March

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Table S3. Solo Rain (SR) SWP description and probabilities of occurrence conditioned to event intensities. Colour scale ranges from light to dark according to quantiles relative to the maximum value in each column. Blue colours represent probabilities of occurrence calculated over the respective number of events (without specific conditions); red scale colours represent BN probabilities conditioned to different thresholds of P24 and wave power and calculated considering their cumulative occurrence in all basins

	Synoptic pattern	n°days	P(SWP) n/N	P(SWP| P24≥100 mm)	P(SWP| P24≥ 200mm)	Long Name	Surface low-pressure location	Surface high-pressure location	500-mb through	500-mb ridge	Prevailing wind direction	Seasonality
Atlantic low	SWP7r-BIL	23	6,1 %	0,0 %	0,0 %	British Islands Low	British Islands	Azores Islands to W Europe	British Islands to Cantabric Sea	Azores Islands to Southern Mediterranean Sea	S-SE	Late Spring + Autumn
	SWP8r-AL	19	5,1 %	13,1 %	0,0 %	Atlantic Low	Atlantic	NW Europe	Atlantic to NW Iberian Peninsula	Azores Islands to Mediterranean Sea	SW	Cold part of the year
	SWP10r-IL	**24**	**6,4 %**	**18,0 %**	**20,0 %**	**Iceland Low**	S Iceland	Azores Islands to W Europe	W British Islands to Cantabric Sea	Azores Islands to Central Europe	SW	Early Autumn + Winter + Spring
	SWP16r-NWAL	17	4,5 %	11,5 %	0,0 %	NW Atlantic Low	Atlantic – S Iceland	Azores Islands to Scandinavian Peninsula	Atlantic to NW Iberian Peninsula	Azores Islands to North Sea	S	Summer + Autumn + January
Cut-off	SWP6r-sNWPC	28	7,4 %	11,5 %	0,0 %	NW Peninsula Cut-Off	SE Iberian Peninsula	British Islands	**	British Islands to N Africa	**	All year
	SWP11r-SBIC	**18**	**4,8 %**	**4,9 %**	**20,0 %**	**S British Islands Cut-Off**	NW to NE Peninsula	E Iceland	**	N Africa to Azores Islands to Iceland	S	Early Autumn + Spring
Trough	SWP1r-SPT	25	6,6 %	3,3 %	0,0 %	Scandinavian Peninsula Thorugh	Scandinavian Peninsula	Atlantic	Scandinavian Peninsula to N Iberian Peninsula	Atlantic to Mediterranean Sea	NW	February to October
	SWP2r-NEET	17	4,5 %	1,6 %	0,0 %	NE Europe Through	Central Europe	Azores Islands and N British Islands to North Sea	NW Europe to NW Mediterranean	N Atlantic to Mediterranean Sea	NW	Late Spring to Early Autumn
	SWP3r-BIT	27	7,2 %	3,3 %	0,0 %	British Islands Through	E Iberian Peninsula	Atlantic to British Islands	North Sea to Iberian Peninsula	Azores Islands to Mediterranean Sea	NW	Late Spring to Early Autumn
	SWP4r-AT	22	5,9 %	6,6 %	0,0 %	Atlantic Through	S Iberian Peninsula	Azores Islands and N Europe	S Iceland to NW Iberian Peninsula	Azores Islands to N Europe	E-SE	All year
	SWP5r-WET	16	4,3 %	1,6 %	0,0 %	W Europe Thorugh	W Iberian Peninsula	Azores Islands to British Islands	British Islands to W Iberian Peninsula	Atlantic to Mediterranean Sea	S-SE	Late Winter + Spring + Autumn
	SWP9r-NWPT	**12**	**3,2 %**	**11,5 %**	**60,0 %**	**NW Peninsula Through**	Atlantic	British Islands to SW Europe and N Africa	Atlantic to NW Iberian Peninsula	British Islands to Central Europe to N Africa	SE	Autumn + Winter + April + June
	SWP12r-NET	23	6,1 %	0,0 %	0,0 %	N Europe Through	Scandinavian Peninsula	South Iceland and Azores Islands	North Europe to Iberian Peninsula	Atlantic to Mediterranean Sea	NW	All year
	SWP13r-NST	29	7,7 %	3,3 %	0,0 %	North Sea Through	North Sea	Atlantic	North Sea to NW Mediterranean	Atlantic Sea to Mediterranean Sea to W Europe	NW	Late Spring to Early Autumn + January
	SWP14r-WSPT	27	7,2 %	8,2 %	0,0 %	W Scandinavian Peninsula Through	N North Sea	Atlantic	North Sea to British Islands to NW Peninsula	Atlantic Sea to Mediterranean Sea to W Europe	SE-SW	Spring to Autumn + January
	SWP15r-CST	29	7,7 %	0,0 %	0,0 %	Cantabric Sea Through	S Iceland	Atlantic and Scandilavian Peninsula	S Iceland to British Islands to Iberian Peninsula	Azores Islands to Scandinavian Peninsula	S-W	Spring to Early Autumn
	SWP17r-IT	20	5,3 %	1,6 %	0,0 %	Iceland Through	Iceland	Atlantic to Azores Islands and N Africa	Iceland to British Islands to Iberian Peninsula	Atlantic to Mediterranean Sea	W	May to September + December

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Figure S2. Composites of the MSLP (contour lines) and Z500 fields (colormap) for the 18 SWP of compound type.

Z500

5000 5500 6000
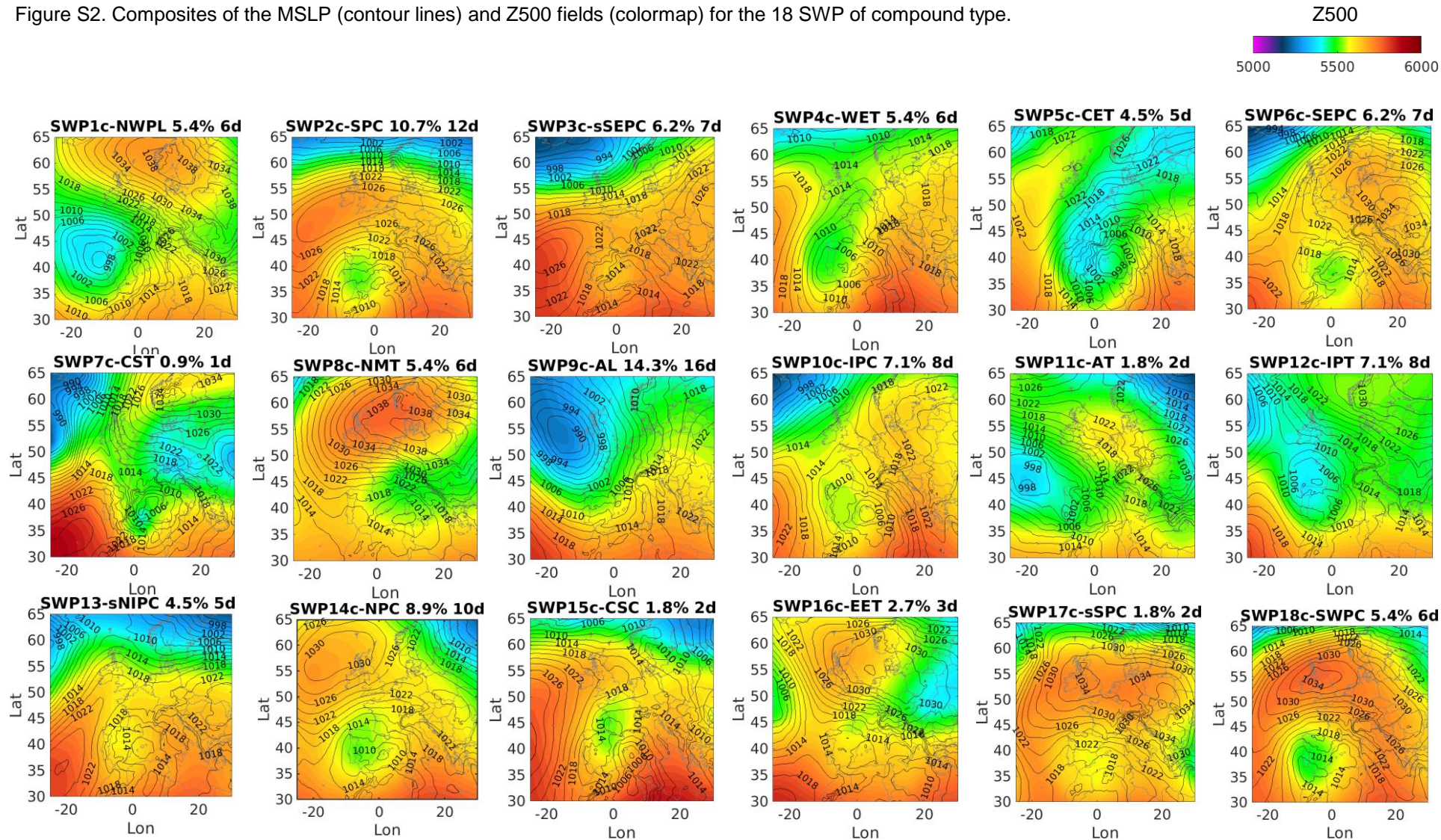
Figure S3. Composites of wind velocity (m/s) field for the18 SWP of compound type.
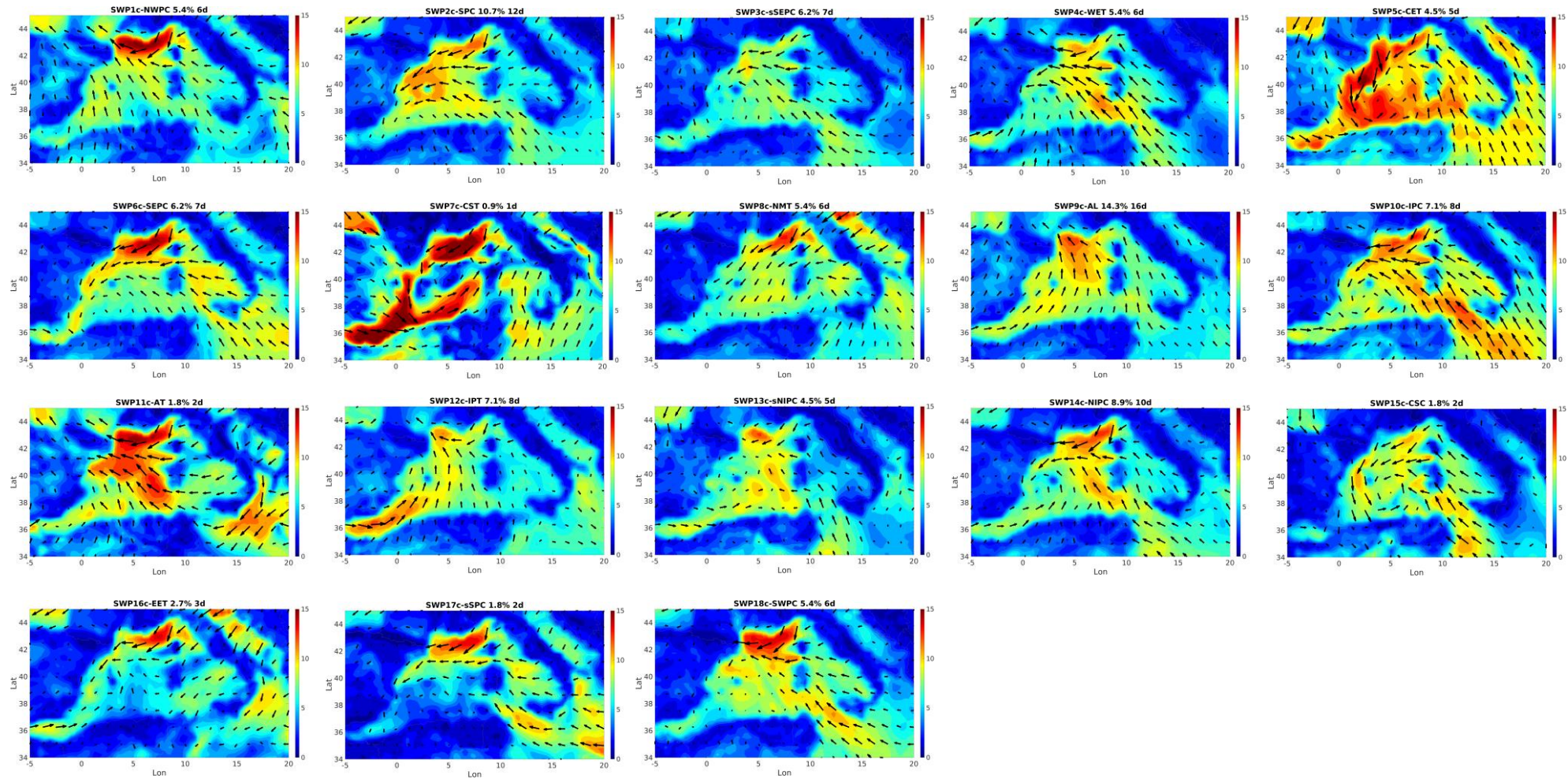
Figure S4. Composites of the MSLP (contour lines) and Z500 (colormap) fields for the 12 SWP of solo wave (SW) type.
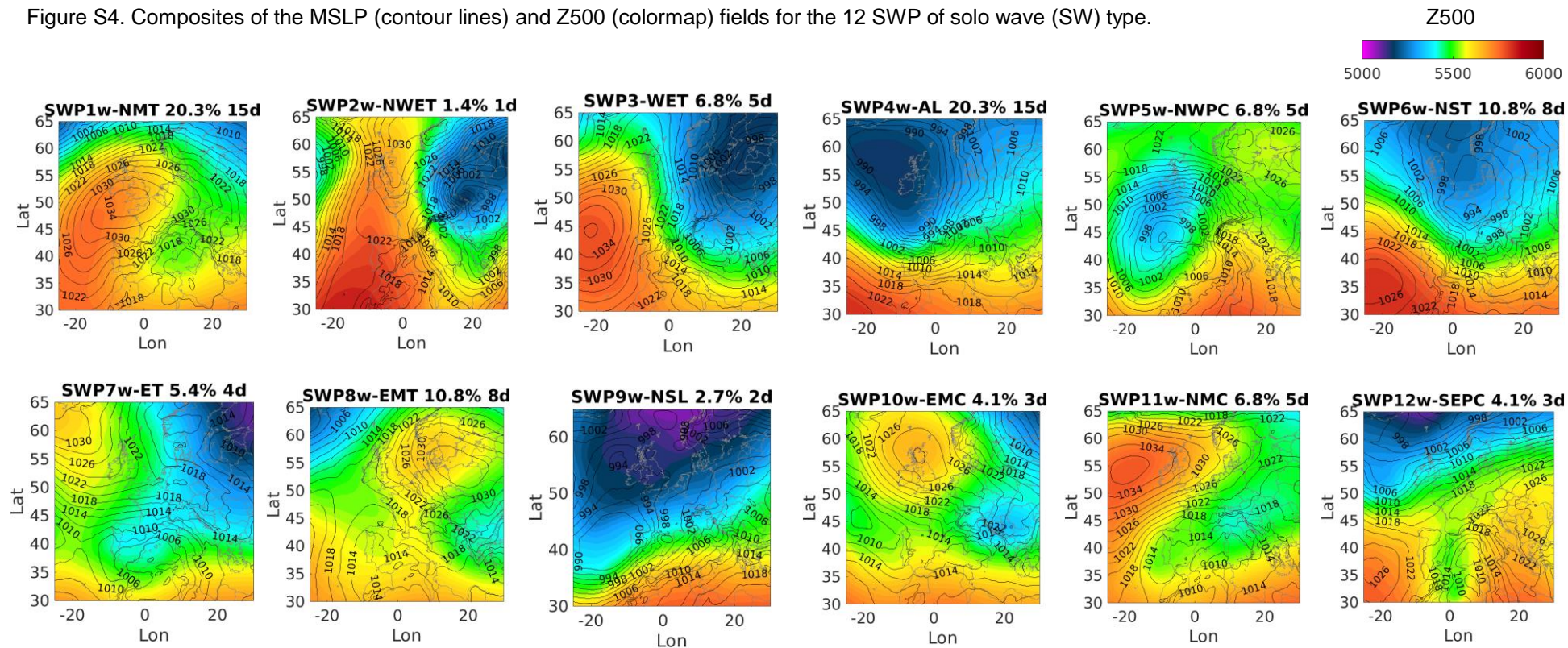
Figure S5. Composites of wind velovity field (m/s) for the12 SWP of solo wave (SW) type.
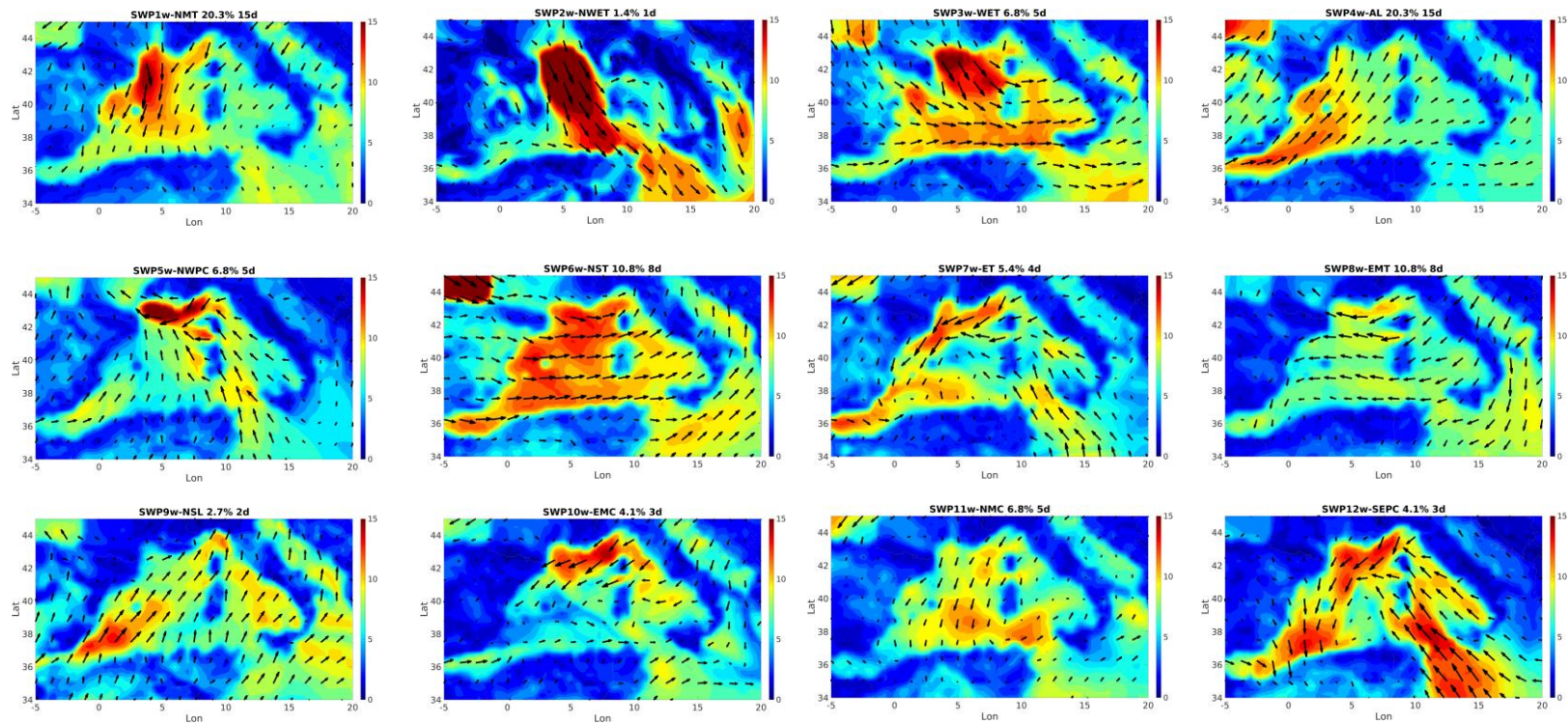
Figure S6. Composites of the MSLP (contour lines) and Z500 (colormap) fields for the 17 SWP of solo rain (SR) type.
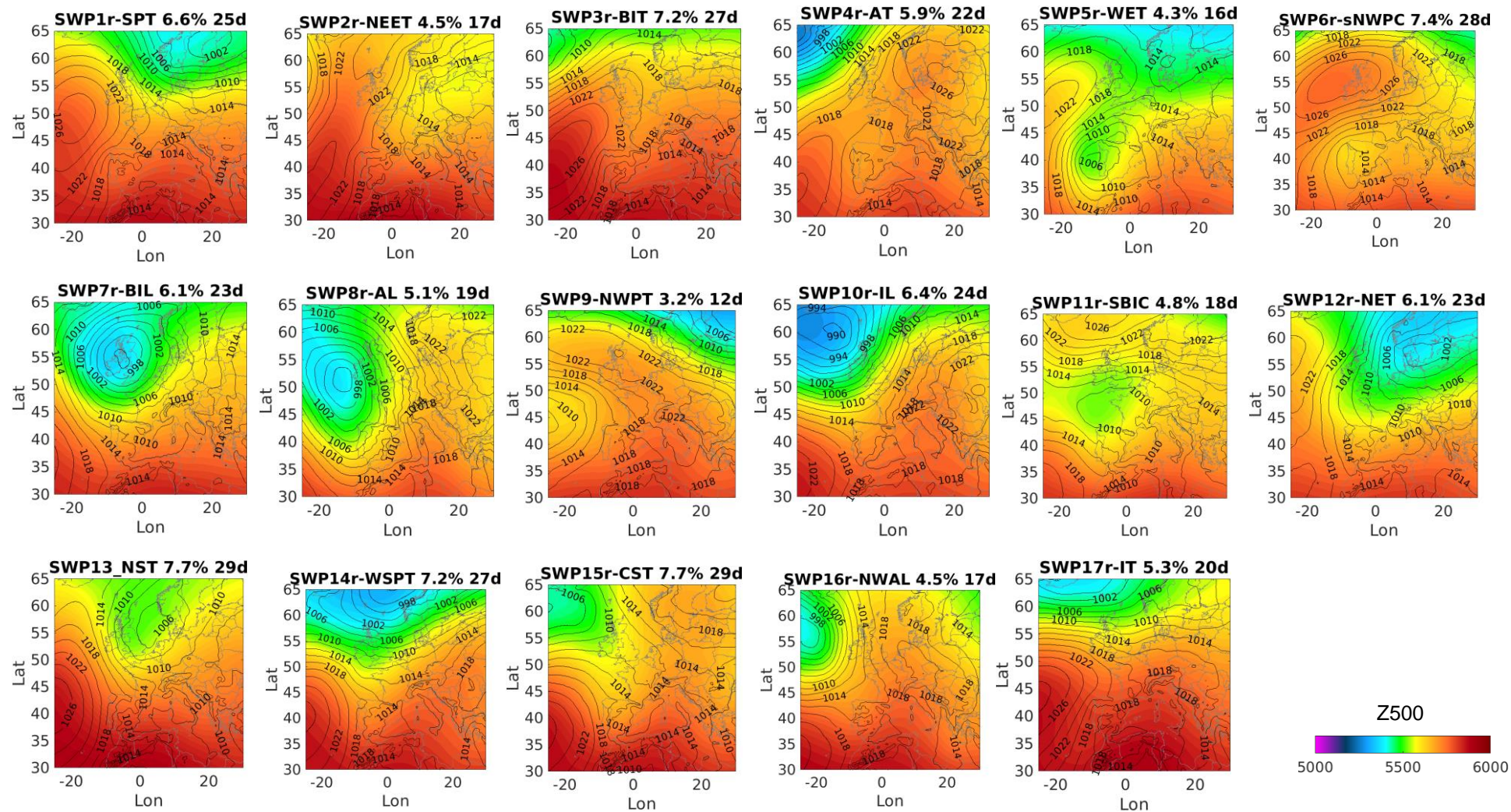
Figure S7. Composites of wind field for the 17 SWP of solo rain (SR) type.