

Supplementary material

Appendix 1

Species	Sex	GPS nr.	Start year	Last year	Great-circle distance nest to wintering stage (km)	SPRING			AUTUMN		
						nr. of migrations tracked	mean recorded distance (km)	mean recorded travel days	nr. of migrations tracked	mean recorded distance (km)	mean recorded travel days
Montagu's H.	female	#190	2010	2011	4343	1	5751	39	1	4530	15
		#187	2009	2010	4179	1	5257	21	1	5099	26
	male	#191	2009	2010	4779	1	5342	37	1	5489	36
		#428	2010	2011	4553	1	6219	33	2	4965	20
	#178	2009	2012	5248	3	7552	30	3	6141	29	
Honey Buzzard	female	#179	2009	2011	5142	2	5779	22	2	5438	26
		#183	2009	2011	5000	2	5934	20	2	5730	24
		#184	2009	2011	5645	2	7493	35	2	6823	38
	#387	2010	2012	6200	2	6522	28	2	6301	28	
	Male	#56	2009	2010	5319	2	6000	23	1	2013	26
		#57	2009	2009	5397	1	5994	23	-	-	-
		#58	2009	2010	5352	2	6054	25	1	3156	23
		#123	2009	2011	5366	1	5697	24	1	5131	26
		#180	2010	2012	5249	3	6083	23	2	5957	28
		#181	2009	2011	5381	2	5819	25	2	5787	30
#182		2009	2012	5163	3	5739	21	2	6086	30	
#389	2010	2012	5344	2	5748	18	2	5929	27		

Table A1: Metadata for all individuals tracked in this study. Devices 56 – 58 were deployed in the summer of 2008 but their 2008 autumn migrations were excluded due to the low sampling resolution in that season. We retained relatively short tracks for some individuals compared to their conspecifics (e.g. Montagu's Harrier #187, Honey

Buzard #56 & #58) because of occasional gaps in the tracks of these individuals, which sometimes caused erroneous classification of travel days as non-travel days. Bird #123 spent the summer of 2010 in Africa due to which only one autumn and one spring journey could be tracked.

Table A3.a: Regional and seasonal differences in hourly boundary layer height, tailwind, absolute crosswinds and precipitation encountered by Honey Buzzard (top) and Montagu’s Harrier (bottom). Class identifiers (a – f) were determined by a Tukey-HSD test for each variable in both species to identify those biomes over which daily weather conditions were significantly similar.

Species	Season	Biome	Boundary Layer Height (m)				Tailwind (m/s)			Crosswind (m/s)			Precipitation (mm)		
			N	mean	sd	class	mean	sd	class	mean	sd	class	mean	sd	class
P. apivorus	autumn	Temp Forest	683	1330.90	17.27	e	-0.61	0.16	c	3.74	0.11	c	0.13	0.02	def
		Mediterranean	788	1609.79	29.21	d	-0.12	0.07	c	2.15	0.08	e	0.07	0.02	efg
		Sea	28	550.60	34.33	g	2.52	0.81	ab	7.52	0.63	a	0.02	0.01	g
		Desert	774	2680.48	44.55	a	0.77	0.12	b	2.92	0.08	d	0.04	0.00	g
		Trop Grass	918	1187.50	19.68	f	-0.91	0.08	c	2.13	0.06	e	0.45	0.03	b
		Trop Forest	145	887.53	19.78	fg	0.02	0.17	c	1.97	0.12	e	0.89	0.07	a
	spring	Temp Forest	831	1406.62	16.35	e	0.15	0.15	c	3.23	0.09	d	0.15	0.01	de
		Mediterranean	899	1430.68	22.90	e	0.98	0.10	b	3.11	0.10	d	0.19	0.02	cd
		Sea	55	889.78	60.86	fg	0.41	0.52	bc	7.27	0.52	a	0.08	0.02	defg
		Desert	905	1909.52	37.14	c	2.54	0.14	a	4.28	0.09	b	0.00	0.00	g
		Trop Grass	981	2190.68	34.08	b	1.35	0.09	b	3.03	0.07	d	0.06	0.01	fg
		Trop Forest	96	1215.88	35.33	ef	1.36	0.16	b	1.71	0.15	e	0.33	0.05	bc
C. pygargys	autumn	Temp Forest	212	1061.53	33.39	de	1.03	0.39	bc	3.75	0.22	a	0.32	0.06	a
		Mediterranean	187	1487.17	66.60	bc	-0.10	0.20	c	1.96	0.12	c	0.05	0.02	b
		Sea	34	620.29	33.92	ef	4.67	0.97	a	4.20	0.37	a	0.00	0.00	b
		Desert	264	2363.63	91.24	a	2.03	0.24	b	2.97	0.12	ab	0.00	0.00	b
		Trop Grass	40	1897.15	204.40	ab	1.42	0.48	bc	2.44	0.25	bc	0.03	0.01	b
	spring	Temp Forest	138	1177.78	53.89	cde	-0.74	0.43	c	2.76	0.20	bc	0.07	0.02	b
		Mediterranean	147	1309.66	66.50	bcd	0.85	0.23	bc	2.24	0.16	bc	0.31	0.07	a
		Sea	30	349.36	24.59	f	0.84	0.35	bc	1.70	0.28	c	0.23	0.09	ab
		Desert	160	2039.21	99.72	a	0.94	0.37	bc	4.12	0.22	a	0.03	0.02	b
		Trop Grass	70	2510.99	175.11	a	2.77	0.37	ab	2.72	0.22	bc	0.00	0.00	b

Table A3.b: Regional and seasonal patterns in daily mean boundary layer height, tailwind and absolute crosswinds encountered by Honey Buzzard (top) and Montagu's Harrier (bottom). Class identifiers (a – f) were determined by a Tukey-HSD test for each variable in both species to identify those biomes over which daily weather conditions were significantly similar.

Species	Season	Biome	Daily mean boundary layer height (m)				Daily mean tailwind (m/s)			Daily mean absolute crosswind (m/s)		
			N	mean	sd	class	mean	sd	class	mean	sd	class
Honey Buzzard	autumn	Temp For	122	1425.97	31.91	e	-1.39	0.42	b	3.90	0.29	ab
		Mediter	76	1796.83	62.17	cd	-0.54	0.17	b	2.16	0.22	cd
		Desert	109	2791.12	71.27	a	0.54	0.32	b	2.93	0.19	bc
		Trop Grass	162	1163.30	35.82	f	-1.20	0.18	b	1.98	0.13	d
		Trop For	28	866.04	31.28	f	0.01	0.42	b	1.65	0.22	d
	spring	Temp For	137	1414.81	28.86	e	-0.09	0.39	b	3.52	0.20	b
		Mediter	84	1533.37	51.60	de	0.70	0.29	b	3.18	0.28	bc
		Desert	103	2015.99	75.40	c	2.33	0.42	a	4.69	0.25	a
		Trop Grass	124	2355.48	63.18	b	0.96	0.20	ab	3.19	0.19	bc
		Trop For	12	1204.04	84.64	ef	1.25	0.41	ab	1.28	0.34	d
Montagu's Harrier	autumn	Temp For	27	1112.10	62.87	c	-0.60	0.44	a	4.31	0.71	a
		Mediter	25	1588.11	115.21	c	6.40	NA	a	2.29	0.46	a
		Sea	2	853.91	140.07	c	1.38	0.70	a	4.83	-	a
		Desert	26	2489.40	148.75	ab	0.18	0.70	a	3.11	0.28	a
		Trop Grass	6	1744.38	487.13	bc	0.23	1.16	a	2.41	0.73	a
	spring	Temp For	19	1187.46	104.59	c	-0.80	1.09	a	3.06	0.44	a
		Mediter	19	1256.28	112.07	c	0.40	0.75	a	3.21	0.62	a
		Desert	21	2341.11	167.49	ab	0.83	1.11	a	4.71	0.62	a
		Trop Grass	7	3017.27	357.61	a	2.14	1.09	a	3.20	0.58	a

Table A4: Initial linear regression models for hourly speed, daily mean speed and daily distance in function of key weather conditions, before backward selection of significant predictor variables. Effect sizes are calculated from original values as well as from values normalized by their grand-means (i.e. means of each variable over the entire dataset for that species). Exact P-values are given for each of the individual factors in the full models.

Spec	Factor	Hourly Speed (m/s)			Daily Distance (km)			Daily Mean Speed (m/s)		
		Eff. Size	Norm. Effect	Sign.	Eff. Size	Norm. Effect	Sign.	Eff. Size	Norm. Effect	Sign.
Honey Buzzard	<i>intercept</i>	6.49	-	< 2E-16*	146.66	-	< 2E-16*	7.74	-	< 2E-16*
	<i>blh (m)</i>	1.75E-03	0.34	< 2E-16*	0.05	0.33	< 2E-16*	9.00E-04	0.19	6.41E-11*
	<i>tailwind (m/s)</i>	0.57	0.58	< 2E-16*	16.32	0.50	< 2E-16*	0.60	0.52	< 2E-16*
	<i>crosswind (m/s)</i>	-0.16	-0.12	< 2E-16*	-5.43	-0.12	9.44E-06*	-0.18	-0.11	1.91E-04*
	<i>precipitation (mm)</i>	-0.23	-0.03	4.1E-05*	-	-	-	-	-	-
Montagu's Harrier	<i>intercept</i>	6.04	-	< 2E-16*	193.23	-	1.46e-12*	7.19	-	< 2e-16*
	<i>blh (m)</i>	5.63E-04	0.19	< 2E-16*	4.39e-03	0.03	0.670	-7.62E-05	0.02	0.79
	<i>tailwind (m/s)</i>	0.49	0.61	< 2E-16*	17.11	0.58	2.20e-13 *	0.47	0.58	3.56e-13*
	<i>crosswind (m/s)</i>	-0.14	-0.07	1.14E-05*	-3.70	-0.07	0.30	4.63E-02	0.04	0.64
	<i>precipitation (mm)</i>	0.04	0.00	0.812	-	-	-	-	-	-



Hourly

Temp. Forest

Mediterranean

Sea

Desert

Trop. Grass

Trop. Forest

Daily

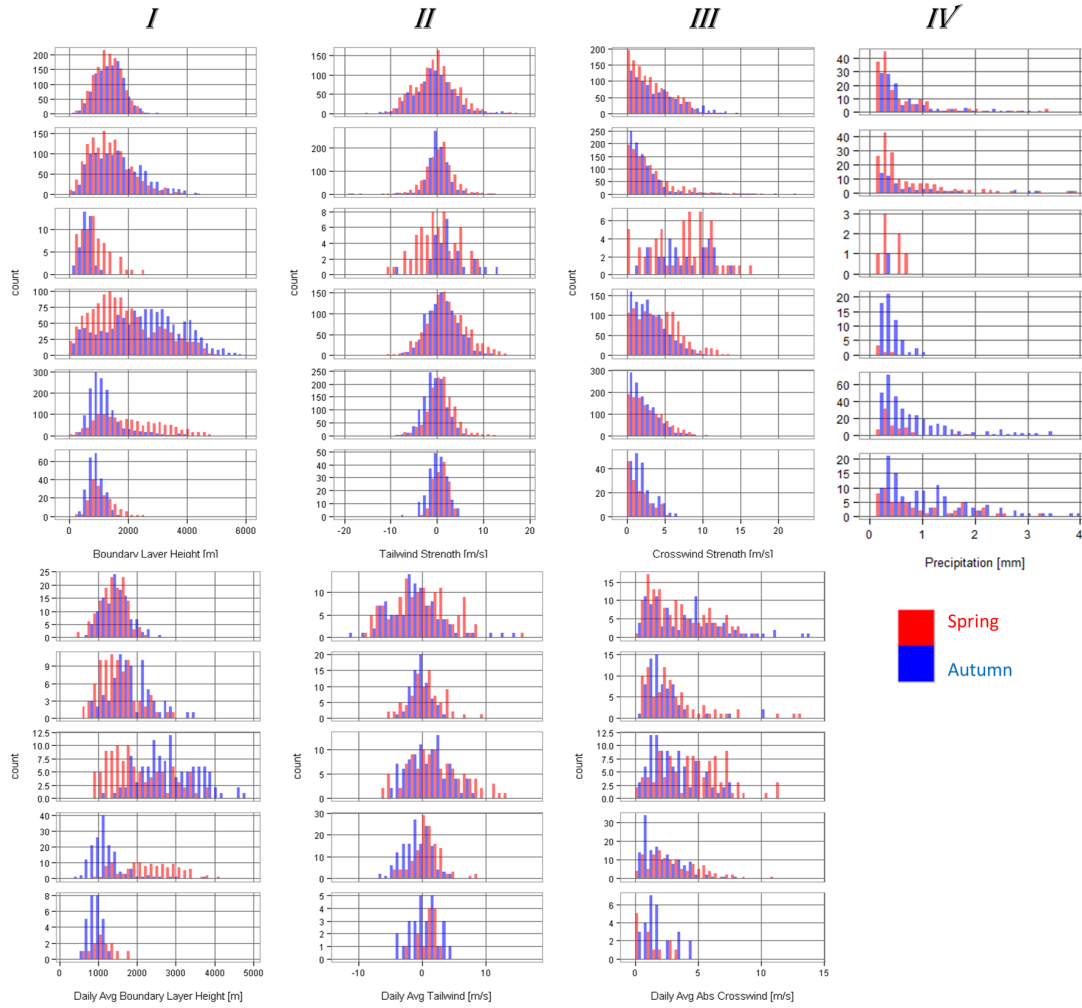
Temp. Forest

Mediterranean

Desert

Trop. Grass

Trop. Forest





Hourly

Daily

Temp. Forest

Mediter

Sea

Desert

Trop. Grass

Temp. Forest

Mediter

Sea

Desert

Trop. Grass

I

II

III

IV

