SkyArrow BLLATE2 flights

DATA INFORMATION

B. Gioli, Nov. 2011
Revised Jan 27, 2012

1. Summary Table of flights

'PA' means the flight is coordinated with the Piper Aztec flying at the same time for BLLATE1

Date	Time UTC	Duration	Type of flight	Notes
June 15	13.30 UTC	2.00	IOP 1	OK (PA)
June 15	16.45 UTC	2.00	IOP 1	OK (PA)
June 19	13.30 UTC	2.20	IOP 2	OK (PA)
June 19	16.45 UTC	2.20	IOP 2	OK (PA)
June 20	13.30 UTC	1.40	IOP 3	OK (PA), aborted at half flight (operator sick)
June 20	16.45 UTC	2.30	IOP 3	OK (PA)
June 24	13.30 UTC	2.20	profile flight (IOP4)	OK
June 24	16.45 UTC	2.20	profile flight (IOP4)	OK
June 25	13.30 UTC	2.00	IOP 5	OK (PA)
June 25	16.45 UTC	2.00	IOP 5	OK (PA)

2. High frequency dataset:

This is comprised of one NetCDF and MATLAB file per flight, containing all the relevant variables at high frequency (50 Hz), as acquired during the flight. This dataset includes both 'raw' variables that are reported as acquired and variables that are deeply post-processed from raw signals (like wind components). Quality flag information is also reported for relevant variables. NetCDF and MATLAB files contain same variables.

NetCDF		*MATLAB*	
Filename	*Filesize*	*Filename*	*Filesize*
MFP_SKYARROW_2011151514.nc	72,721,827	MFP_SKYARROW_2011151514.mat	34,140,222
MFP_SKYARROW_2011151818.nc	75,860,307	MFP_SKYARROW_2011151818.mat	34,462,121
MFP_SKYARROW_2011191552.nc	89,832,355	MFP_SKYARROW_2011191552.mat	42,151,043
MFP_SKYARROW_2011191903.nc	92,273,395	MFP_SKYARROW_2011191903.mat	42,074,309
MFP_SKYARROW_2011201551.nc	57,471,139	MFP_SKYARROW_2011201551.mat	26,022,765
MFP_SKYARROW_2011201905.nc	92,447,755	MFP_SKYARROW_2011201905.mat	41,076,089
MFP_SKYARROW_2011241551.nc	90,378,683	MFP_SKYARROW_2011241551.mat	41,832,461
MFP_SKYARROW_2011241901.nc	91,192,363	MFP_SKYARROW_2011241901.mat	41,210,315
MFP_SKYARROW_2011251546.nc	76,720,483	MFP_SKYARROW_2011251546.mat	35,347,168
MFP_SKYARROW_2011251857.nc	75,744,060	MFP_SKYARROW_2011251857.mat	34,411,466

Variables present in each NetCDF or MATLAB datafile at 50 Hz freq:

Variable name	*Description*	*Units*
Alt	Altitude	[m]
F_CO2	CO2 Li7500 mass density	[g m-3]
F_H2O	H2O Li7500 mass density	[g m-3]
INS_Hdg	Aircraft true heading	[deg]
Hgt_alt	Elevation vs ground (altimeter)	[m]
Hgt_DTM	Elevation vs ground (DTM)	[m]
Lat	Latitude	[deg]
Lon	Longitude	[deg]
Time	Time UTC	[yyyy mm dd hh mm ss]

Net	Net radiation	[W m-2]
PAR_i	PAR incoming radiation	[umol m-2 s-1]
PAR_r	PAR reflected radiation	[umol m-2 s-1]
P	Pressure	[mbar]
INS_Pth	Aircraft pitch angle	[deg]
RhoD	Dry air density	[kg m-3]
INS_Roll	Aircraft roll angle	[deg]
SpdAir	Aircraft air-speed	[m s-1]
SpdGnd	Aircraft ground-speed	[m s-1]
T_air	Air temperature	[°K]
Tsfc	Surface temperature	[°C]
Wind_U	U wind component	[m s-1]
Wind_V	V wind component	[m s-1]
Wind_W	W wind component	[m s-1]
T_air_QC	Tair quality flag [0 = good; 10 = interpolated]	
Wind_QC	Wind quality flag [0 = good; 10 = interpolated]	
Hgt_alt_QC	Altimeter quality flag [0 = good; 10 = missing]	
INS_QC	INS quality flag [0 = good; 10 = interpolated]	

Quality flags note:

Some variables have quality flag associated variables, that can be used to mark good and bad data. Such flags are related to technical issues of specific devices, that can affect one or more variables. Variables that do not have a quality flag are basically always properly acquired and processed.

NB. Variables are typically processed also on correspondance with 'bad' quality flag, to obtain continuous signals. It is up to the user and application if to use complete processed signals or remove bad portions. Specific note on each quantity that has QC issues reported below.

- Air temperature fast measurements QC:

Our fine wire fast response thermocouple circuit is affected by noise when on-board radio in transmission mode is used by pilot; thus such data portions (some blocks of few seconds per flight), have been quality flagged, and lineraly interpolated in the data signals.
Tair contains the continuous signal; Tair_QC equals 0 for good points, and 10 for interpolated points.

- INS and wind QC:

In case of bad performance of INS system measuring attitude angles, wind computation is also potentially affected. Such points have been interpolated at the level of attitude angles, using additional inertial information coming from accelerometers and GPS; the quality of this interpolation is typically good up to few seconds of missing data, while it degrades for longer missing intervals. Wind is affected more on the level of horizontal components, rather than vertical (i.e fluxes can typically be run safely on continuous signals)

INS_QC maps interpolated INS data, while Wind_QC maps potentially bad resulting wind data (the two QC vectors are the same and repeted for user convenience)

NB. Only the first 4 flights (June 14 and 15) have occasionally bad QC on INS and wind, since afterwords a second INS was also installed guaranteeing a continuous operation on all following flights.

- Laser altimeter and ground distance QC:

Laser altimeter readings, reporting measured distance from the ground, are available only when return pulses are generated, i.e only at low altitude.
QC_Hgt variable maps points when a return pulse is not recorderd by instrument; on those points, the Hgt value should not be considered (it is either a missing value or a repetition of last good value).

NB. Distance from ground information is also provided by the Hgt_DTM variable, that computes it as the difference between GPS elevation and ground elevation reported by the SRTM 90m digital elevation model. Such variable has no gaps.

3. Transects and profiles markers

Next Table defines start and stop markers to extract good flight portions from flight files. Markers are defined in seconds. This table includes also markers for vertical profiles that can be used to extract vertical profiles from entire flight files.

Label conventions:
"PR_xx_UP" denotes a vertical profile made on point xx going UP (or DN)
"A-B_xx" denotes a horizontal transect between points A and B at level xx, specifically:
"_TR" denotes a level in the troposphere
"_L1" to "_L5" denotes a level in the PBL, L1 is minimum level altitude (typically 700 ft AGL)

Flight File [ddhhmmss]	Start [sec]	End [sec]	Label
06151514	328	1458	PR_P1_UP
06151514	1978	2468	P1–E1_TR
06151514	2563	3360	E1–W1R_L4
06151514	3508	4393	W1R-E1_L3
06151514	4479	5276	E1-W1R_L2
06151514	5402	6245	W1R-E1_L1
06151818	428	1558	PR_P1_UP
06151818	1598	2223	P1–W1_TR
06151818	2373	3150	W1–E1_TR
06151818	3493	4358	E1-W1_L3
06151818	4540	5468	W1–E1_L2
06151818	5626	6523	E1-W1_L1
06191552	501	1128	N1R-S1R_L1
06191552	1222	1848	S2R-N2R_L1
06191552	2028	2661	N1R-S1R_L1
06191552	2798	3448	S2R-N2R_L1
06191552	4172	4877	W1R-E1R_L1
06191552	5010	5777	E2R-W2R_L1
06191552	5940	6639	W1R-E1R_L1
06191552	6765	7572	E2R-W2R_L1
06191903	474	1050	N1R-S1R_L1
06191903	1268	1853	S3R-N3R_L1
06191903	2092	2681	N1R-S1R_L1
06191903	2918	3537	S3R-N3R_L1
06191903	4302	5009	W1R-E1R_L1
06191903	5228	5985	E3R-W3R_L1
06191903	6208	6920	W1R-E1R_L1

06191903	7123	7883	E3R-W3R_L1
06201551	498	1854	PR_P2_UP
06201551	1898	2526	P2-W1R_TR
06201551	2546	3173	PR_W1R_DN
06201551	3248	4060	W1R-E1R_L2
06201551	4211	4909	E1R-W1R_L1
06201905	578	1661	PR_P2_UP
06201905	1758	2373	P2-W1R_TR
06201905	2375	2738	PR_W1R_DN
06201905	2784	3598	W1R-E1R_L3
06201905	3704	4408	E1R-W1R_L2
06201905	4510	5310	W1R – E1R_L1
06201905	5532	6235	E3R – W3R_L1
06201905	6303	7118	W3R - E3R_L2
06201905	7254	7951	E3R – W3R_L3
06241551	428	1193	PR_P3_UP
06241551	1200	1388	PR_P3_DN
06241551	1458	1698	P3-P2_L3
06241551	1738	2028	PR_P2_UP
06241551	2033	2333	PR_P2_DN
06241551	2406	2608	P2-S3R_L3
06241551	2618	3178	PR_S3R_UP
06241551	3183	3388	PR_S3R_DN
06241551	3398	3618	S3R-S1R_L3
06241551	3648	3898	PR_S1R_UP
06241551	3905	4228	PR_S1R_DN
06241551	4258	4461	S1R-P3_L3
06241551	4468	5078	PR_P3_UP
06241551	5088	5248	PR_P3_DN
06241551	5258	5448	P3-P2_L3
06241551	5478	5668	PR_P2_UP
06241551	5688	6028	PR_P2_DN
06241551	6078	6288	P2-S3R_L3
06241551	6298	6678	PR_S3R_UP
06241551	6688	7058	PR_S3R_DN
06241551	7098	7326	S3R-S1R_L3
06241551	7333	7578	PR_S1R_UP
06241901	388	1163	PR_P3_UP
06241901	1173	1408	PR_P3_DN
06241901	1453	1673	P3-P2_L3
06241901	1680	2141	PR_P2_UP
06241901	2146	2448	PR_P2_DN
06241901	2468	2663	P2-S3R_L1
06241901	2698	3460	PR_S3R_UP
06241901	3468	3658	PR_S3R_DN
06241901	3703	3917	S3R-S1R_L3
06241901	4018	4200	PR_S1R_DN
06241901	4204	4371	S1R-P3_L1
06241901	4378	5144	PR_P3_UP
06241901	5163	5363	PR_P3_DN
06241901	5415	5628	P3-P2_L3

06241901	5633	6044	PR_P2_UP
06241901	6048	6338	PR_P2_DN
06241901	6352	6538	P2-S3R_L1
06241901	6540	7223	PR_S3R_UP
06241901	7228	7415	PR_S3R_DN
06241901	7458	7673	S3R-S1R_L3
06251546	378	905	PR_P3_UP
06251546	916	1068	PR_P3_DN
06251546	1070	1330	P3-W1_L5
06251546	1450	2478	W1–E1_L5
06251546	2589	3412	E1-W1_L4
06251546	3512	4520	W1–E1_L3
06251546	4621	5460	E1-W1_L2
06251546	5532	5824	W1–P3_L1
06251546	5828	6368	PR_P3_UP
06251857	358	912	PR_P3_UP
06251857	914	1024	PR_P3_DN
06251857	1058	1339	P3-W1_L5
06251857	1483	2524	W1–E1_L5
06251857	2648	3447	E1-W1_L4
06251857	3549	4580	W1–E1_L3
06251857	4705	5521	E1-W1_L2
06251857	5607	5922	W1–P3_L1
06251857	5924	6429	PR_P3_UP