



Flagging Total Ozone Data

How to get a proper data set out of
the multi-instrumental Arosa total
ozone measurements ?



Goal

Total ozone data series should be free from outliers for further data quality control

Problem

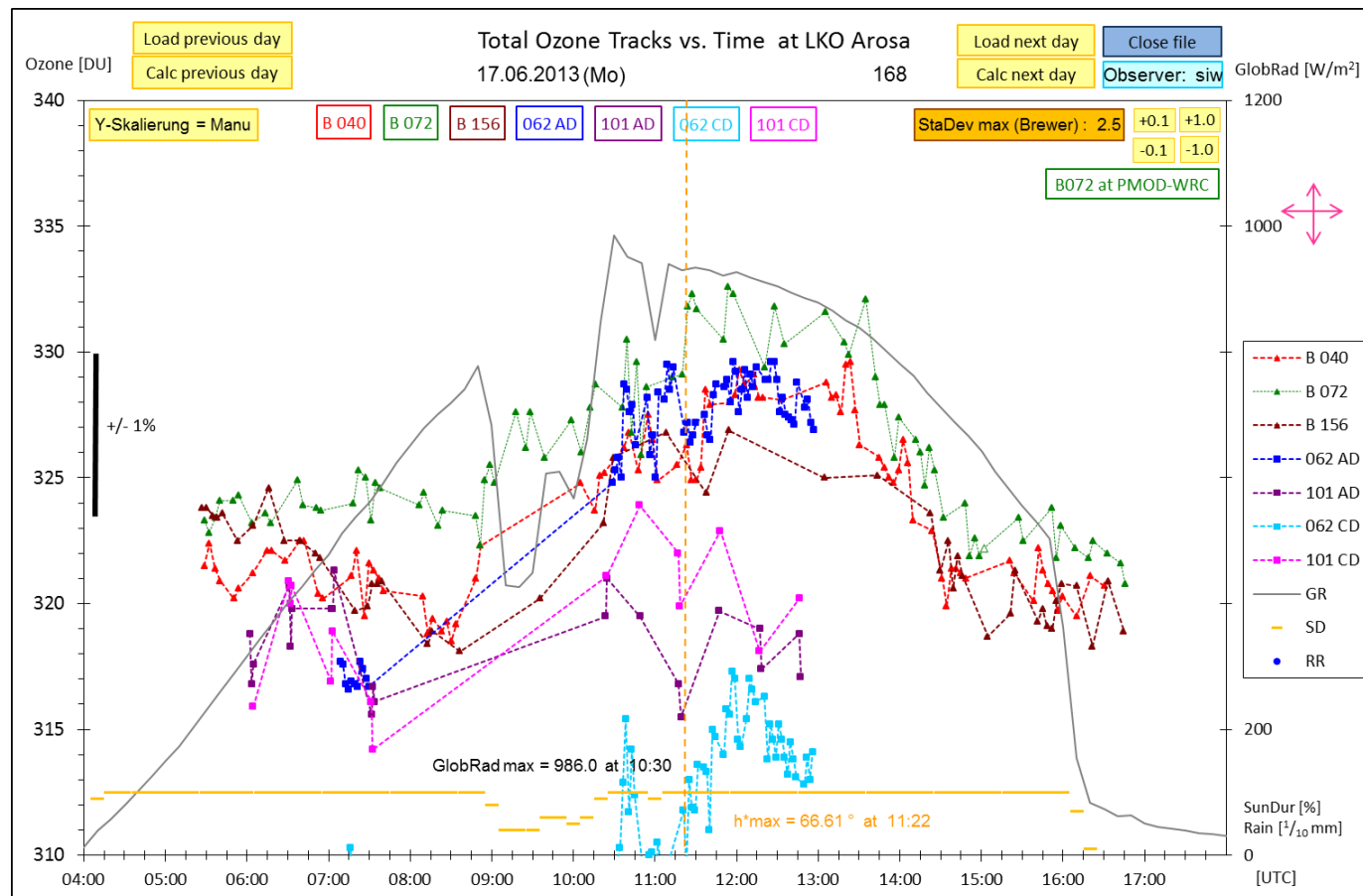
Much more Dobson total ozone measurements with the automatization of the instruments, e.g.:

2006: D062+D101: **2000** measurements, about 10% flagged

2014: D062 **11'300** ms (Jan-Jun) , about 8% flagged

What could be the most efficient methode to flag big amounts of data ?

In the years 2001ff flagging has been performed on a day-to-day basis including all instruments (Brewer, Dobsons):



O8	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	
1	Single ozone value corrections Brewer/Dobson																	
2	January 2013 UTC																	
3	dd mm	jdn	Instr	nf	hh:mm:ss	time	temp	my	Ozon	sd/sun	SO ₂	sd	Flag A	Flag C	Flag D	Remarks		
4	1 1	1	40	0	10:22:11	10.37	8	3.012	318.4	1.4	-3.0	2.0	1			Sc, Ac, Ci clouds		
5	1 1	1	156	0	12:20:01	12.33	9	2.965	347.2	2.5	-0.9	0.9	1			Sc, Ac, As, Ci clouds		
6	1 1	1	62	11	09:43:29	9.72	21	3.392	284.4	33.0			1		1	Sc, Ac, Ci clouds		
7	1 1	1	62	11	09:46:47	9.78	21	3.351	307.3	33.0			1		1	Sc, Ac, Ci clouds		
8	1 1	1	62	13	09:48:13	9.80	21	3.333	291.5	33.0				4		AutoDob error: wL C too low		
9	1 1	1	62	11	09:48:55	9.82	21	3.325	307.9	33.0			1		1	Sc, Ac, Ci clouds		
10	1 1	1	62	11	09:51:02	9.85	21	3.300	302.2	33.0			1		1	Sc, Ac, Ci clouds		
11	1 1	1	62	11	10:12:45	10.21	21	3.091	304.8	33.0			1		1	Sc, Ac, Ci clouds		
2061	23 6	174	101	23	11:51:12	11.85	28	1.094	307.7	38.0				4		Measurement error: wL C too high/low (her)		
2062	23 6	174	101	23	11:52:30	11.88	28	1.095	326.3	38.0					4	Measurement error: wL D too high/low (her)		
2063	23 6	174	101	21	11:52:42	11.88	28	1.095	329.2	38.0					4	Measurement error: wL D too high/low (her)		
2064	26 6	177	40	0	08:12:01	8.20	8	1.405	343.6	2.0	-0.7	0.5	1			Sc, St clouds, fog		
2065	26 6	177	40	0	09:10:36	9.18	11	1.225	321.4	0.6	3.8	0.6	1			Sc, St clouds, fog		
2066	26 6	177	72	0	06:52:49	6.88	6	1.878	345.3	1.7	1.3	1.5	1			Sc, St clouds, fog		
2067	26 6	177	72	0	07:37:24	7.62	7	1.565	346.1	1.6	1.2	0.8	1			Sc, St clouds, fog		
2068	26 6	177	72	0	08:23:43	8.40	7	1.359	343.2	2.5	1.7	0.4	1			Sc, St clouds, fog		
2069	26 6	177	72	0	12:21:48	12.36	12	1.113	347.5	2.1	2.7	0.5	1			Sc clouds		
2070	26 6	177	72	0	13:40:08	13.67	12	1.233	358.6	1.9	-0.4	0.2	1			Sc clouds		
2071	26 6	177	72	0	16:09:46	16.16	14	2.027	346.4	2.1	1.9	0.3	1			Sc, Ac clouds		
2072	26 6	177	156	0	08:16:04	8.27	10	1.389	357.2	2.1	-3.4	0.1	1			Sc, St clouds, fog		
2073	26 6	177	156	0	08:16:04	8.27	10	1.389	357.2	2.1	-3.4	0.1	1			Sc, St clouds, fog		
17	062 N	20130501	73	23	102118	48.1	0.0	102159	28.6	0.0	102239	90.7	0.0	0.0	0.0	1.201	1.200	1.200
18	062 N	20130501	73	23	102325	47.8	0.0	102405	28.1	0.0	102446	90.6	0.0	0.0	0.4	1.199	1.198	1.198
19	062 N	20130501	73	23	102531	48.0	0.0	102611	28.4	0.0	102652	90.6	0.0	0.0	0.0			

Old method: FlagSgozon

- day-by-day flagging
- all instruments: 3 Brewers, 2 resp. 3 Dobsons (AD, CD wavelengths)
- meteorological parameters included (GlobRad, SunDur, Rain)
- flagging subjective (by personal decision)

New method: ScanSingo

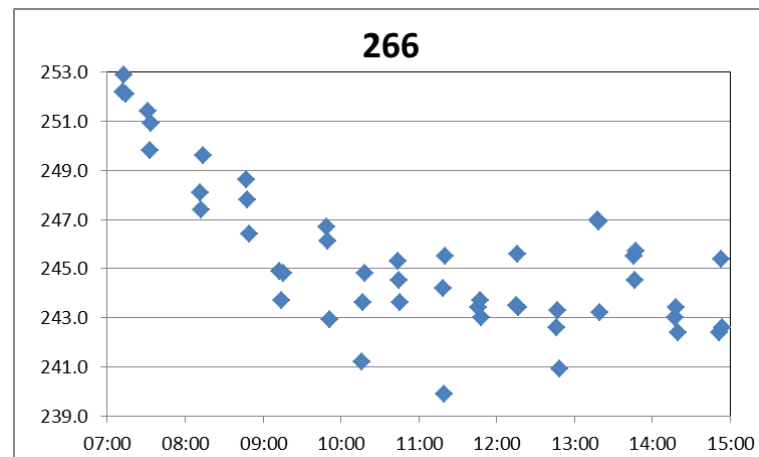
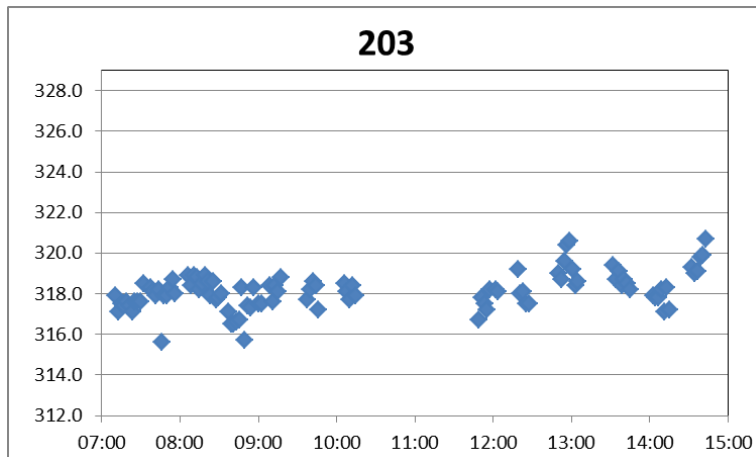
- each instrument separate
- Dobsons: single wavelengths C, D, A; combined w/ AD, CD
- flagging objective

→ What is the best method ?



What is an «Outlier» ?

- a value that differs more or less from an entity
- most statistical definitions base on normal distribution of a dataset
- daily time series of total ozone measurements show very different shapes:



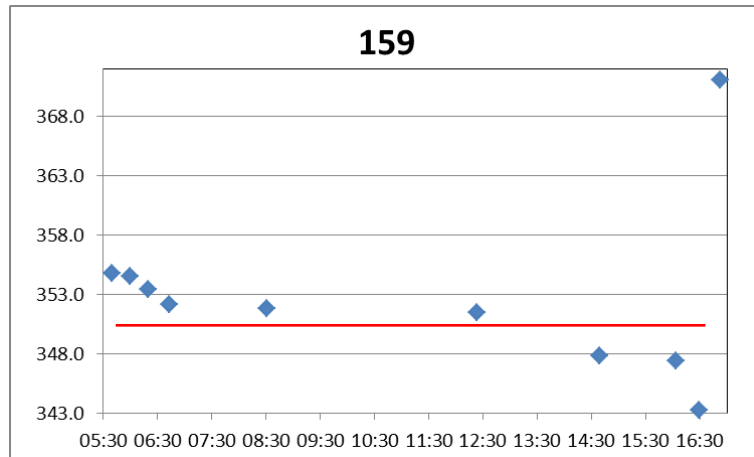
→ daily mean as reference for the entity will cause problems



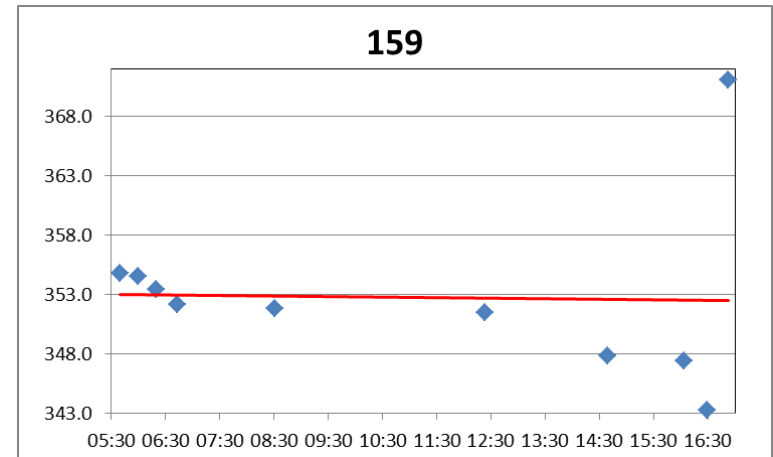
Method (resp. program code) should work for datasets with few as well as with many data points (measurements), i.e. method should be applicable to days with only a few total ozone measurements, either due to bad weather conditions or due to instrument failure, or other reasons

→ Reference should be flexible:

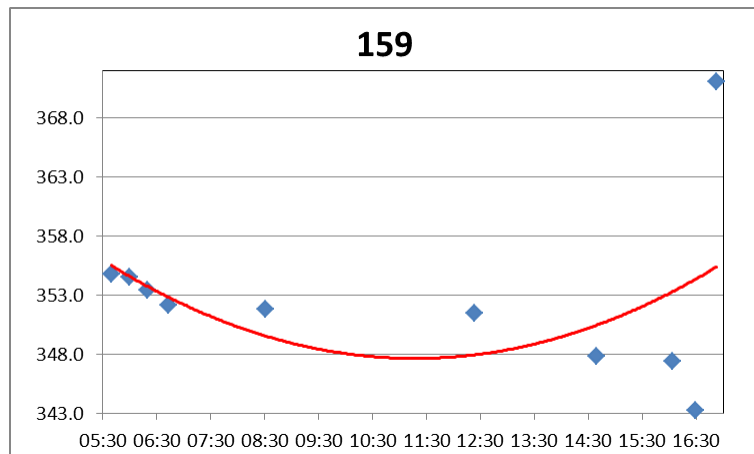
- daily mean
- linear regression
- polynome of higher order
- stability of consecutive measurements



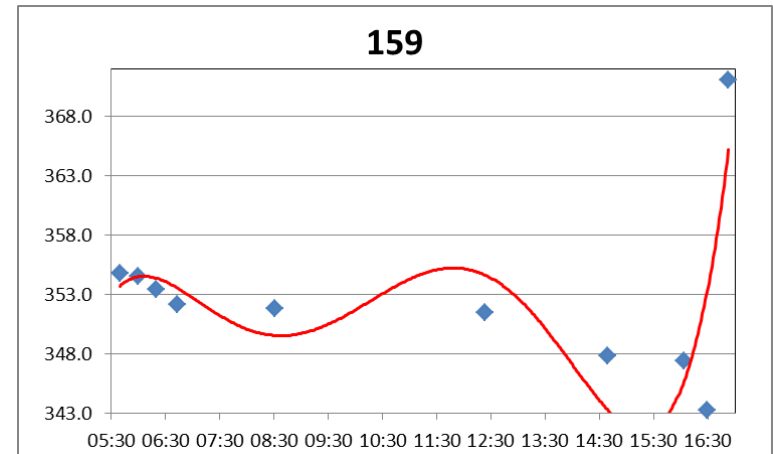
Daily Mean of Measurements



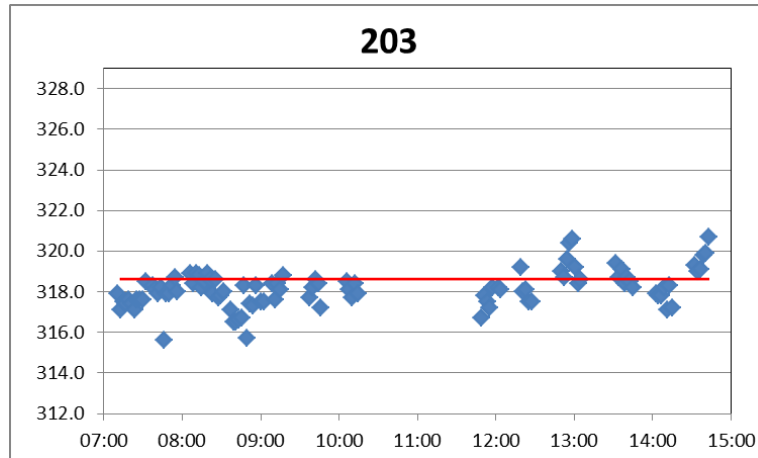
Linear Regression to Measurements



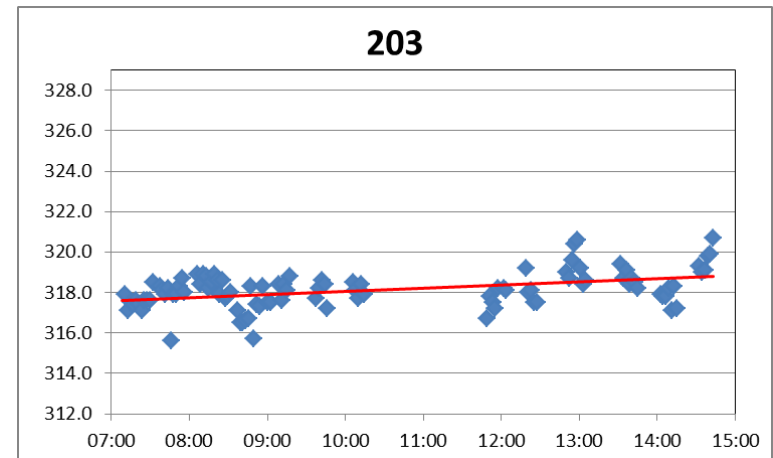
Polynome of 2nd Order



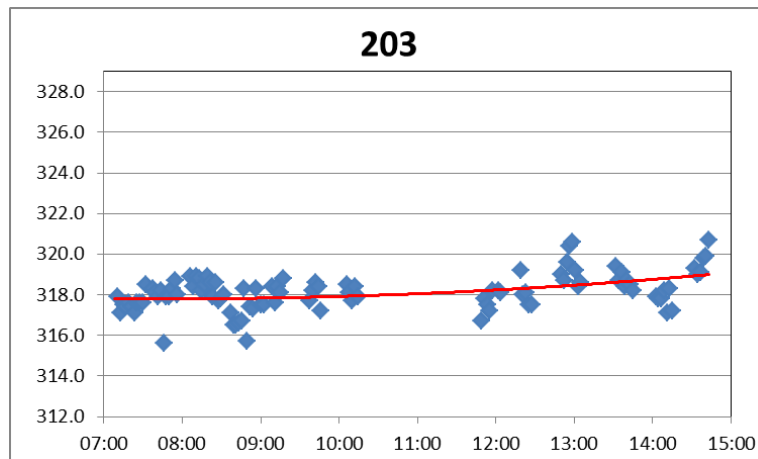
Polynome of 4th Order



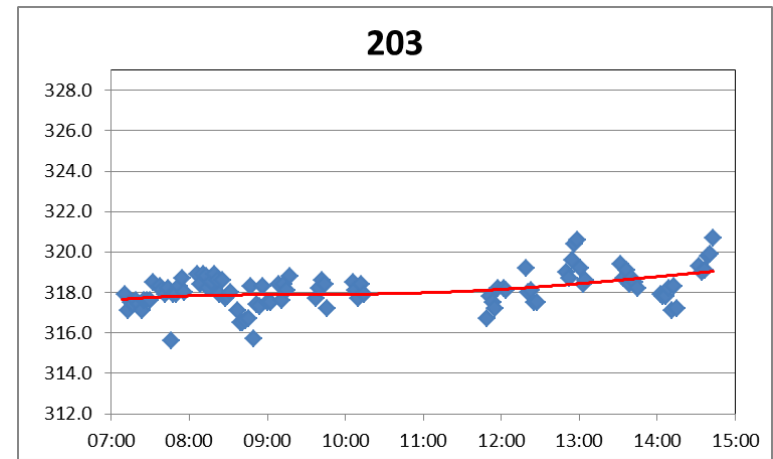
Daily Mean of Measurements



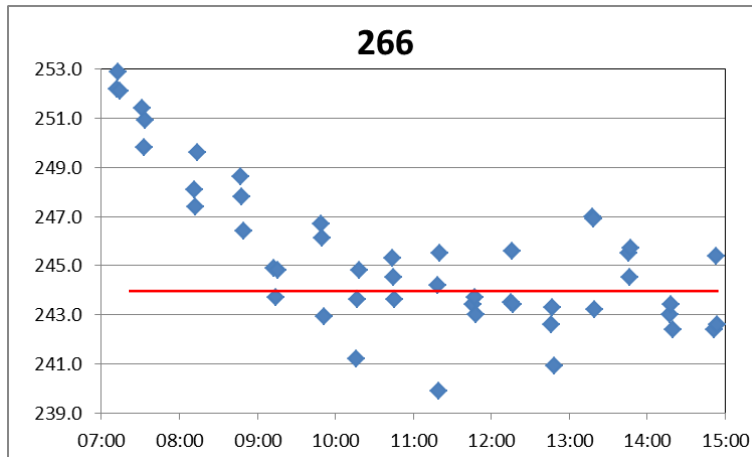
Linear Regression to Measurements



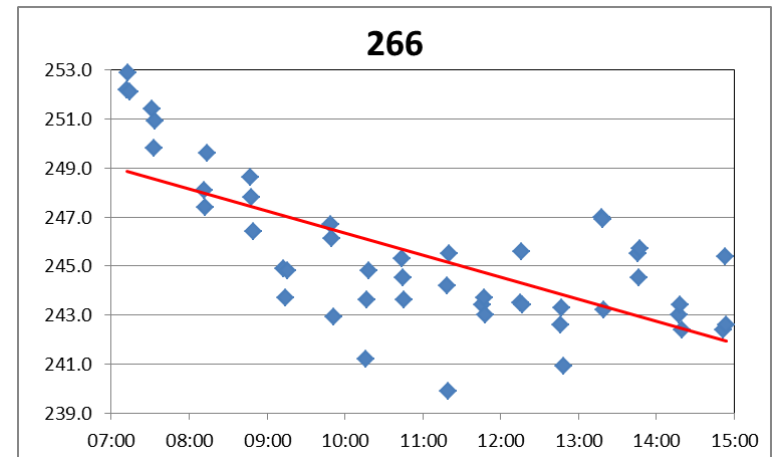
Polynome of 2nd Order



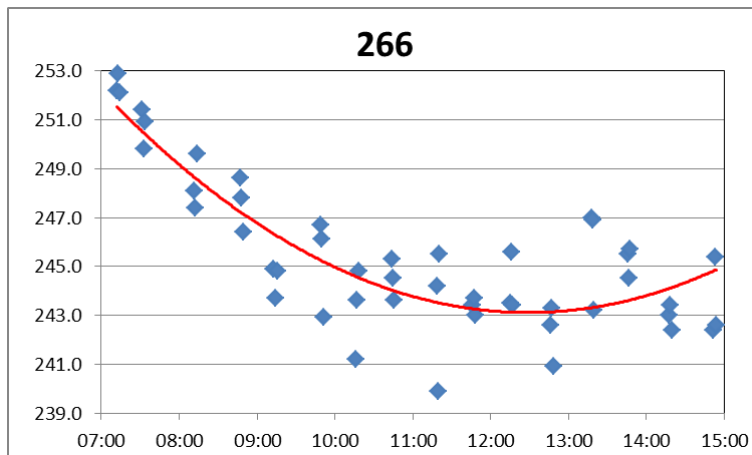
Polynome of 4th Order



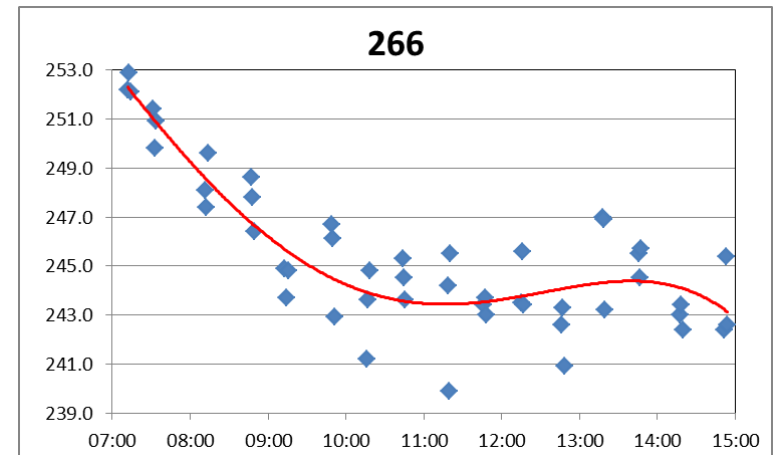
Daily Mean of Measurements



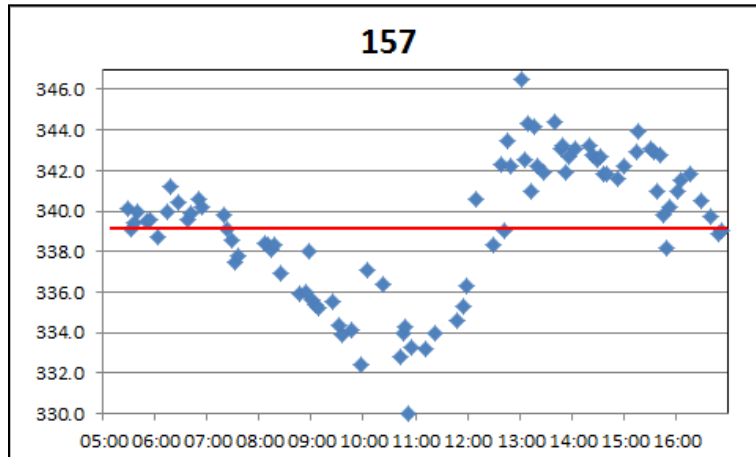
Linear Regression to Measurements



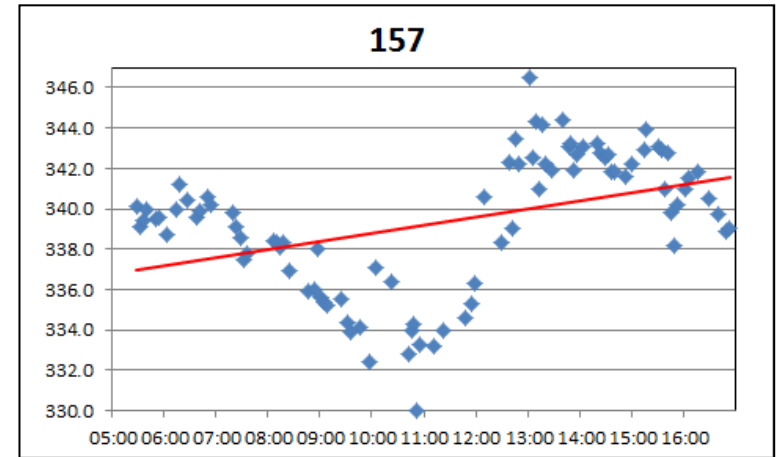
Polynome of 2nd Order



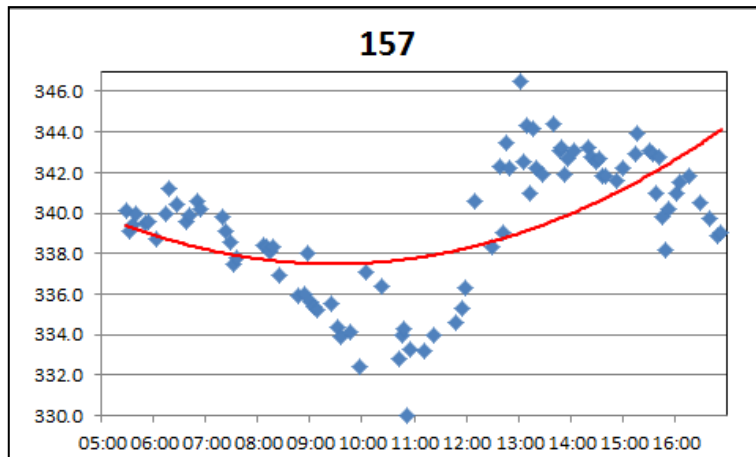
Polynome of 4th Order



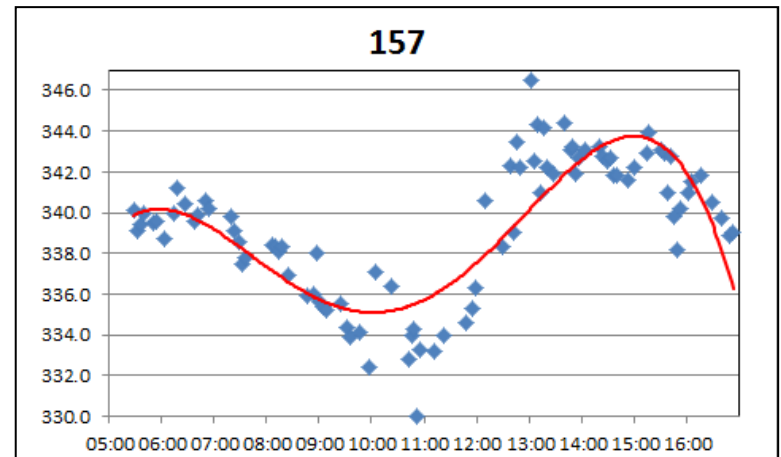
Daily Mean of Measurements



Linear Regression to Measurements



Polynome of 2nd Order



Polynome of 4th Order



Features of ScanSingo (VBA):

Reference could be either:

- daily mean calculated
- daily mean of homogenized dataset
- linear regression
- polynome of higher order (on days with only a few measurements, order is reduced)

Consecutive measurements stability check may be combined with one of the above

Processing is iterative: worst outlier will be eliminated first, then daily mean and fitting curve are recalculated etc.

Features of ScanSingo (2):

Limits for relative differences of a point to the reference can be set for each wavelength or combination of it separately:

Run 'ScanSingo' to find outliers ($RelDiff > RelDiffLimit$) in table 'Diiiwl' flag them and list them to 'ScanSgoz'; if $wl='all'$, then a sequence of C-A-D-AD is performed.

Standard RelDiff Limits [%]					
C	D	A	AD	CD	Brewer
3.20	5.00	2.50	2.70	3.50	2.50
1.60	4.00	1.00	1.50	4.50	1.50
4.00	5.00	2.50	2.50	4.50	2.50
1.60	4.00	1.00	1.50	4.50	1.20

RelDiff Dayoz Limit [%]

RelDiff polyN Reg Limit [%]

RelDiff Homoz Limit [%]

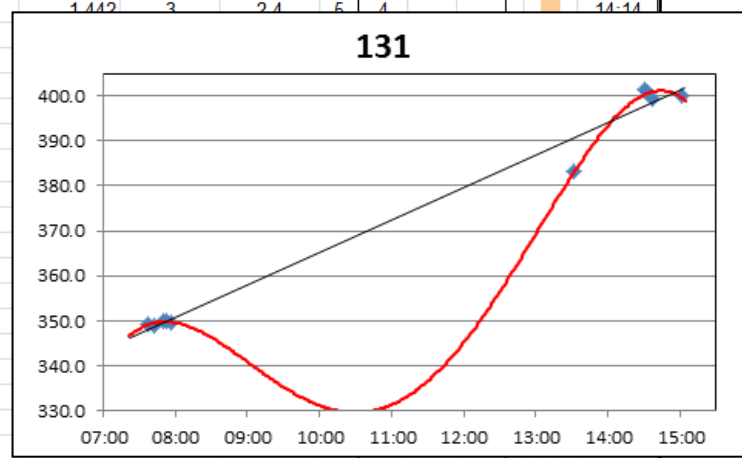
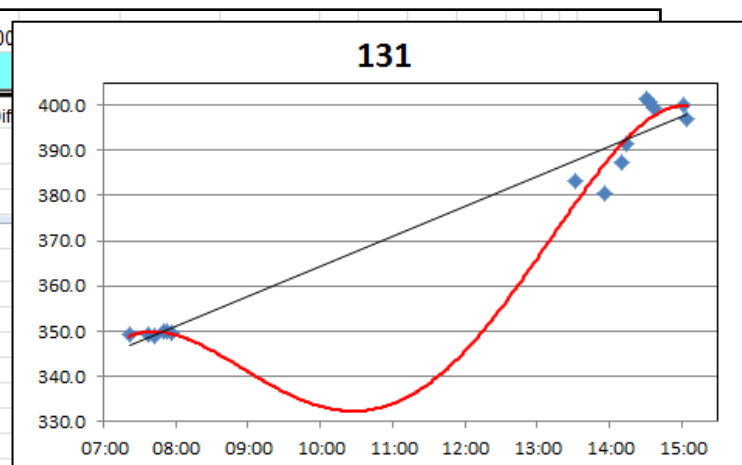
RelDiff Ozone consecut. Limit [%]

Statistics is calculated after the flagging (number and percentage of flagged measurements for each wavelength)



Results

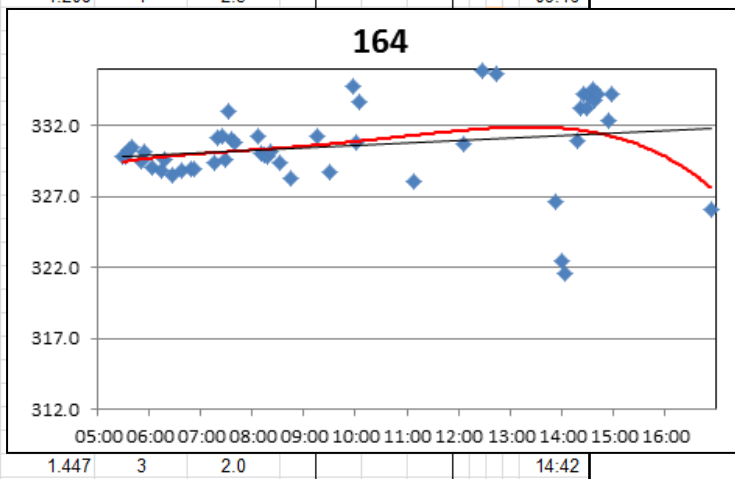
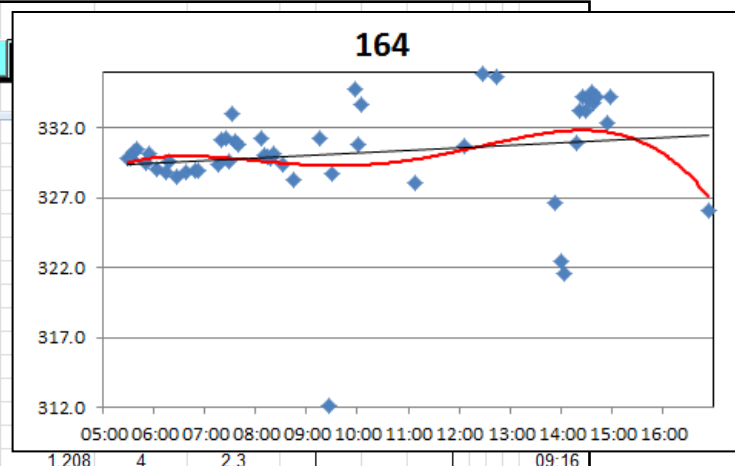
1	B 072 Total Ozone 2014				RelDiff Limits [%]:		2.50	1.50	1.00	1.00
2	Measurements: 6638				Version: 06.03.2013 13:05:00 Cal13a		Make Day Plot			
3	Date	Time	JDN	n	Ozone	Dayoz	OzRDiff	PolyOz	Poly4RDiff	consecRDiff
4	01.01.2014	09:27:02	001	1	335.7	337.0	-0.38	336.1	-0.11	
5	01.01.2014	09:32:44	001	2	336.3	337.0	-0.20	336.2	0.02	
6	01.01.2014	09:36:10	001	3	336.9	337.0	-0.03	336.3	0.18	
4584	10.05.2014	14:10:27	130	35	341.4	343.4	-0.58	340.8	0.19	
4585	11.05.2014	07:21:40	131	1	349.4	375.9	-7.05	348.8	0.16	
4586	11.05.2014	07:37:17	131	2	349.4	373.3	-6.39	349.1	0.09	
4587	11.05.2014	07:42:57	131	3	348.9	373.3	-6.53	349.5	-0.18	
4588	11.05.2014	07:49:50	131	4	350.1	373.3	-6.20	349.7	0.10	
4589	11.05.2014	07:53:16	131	5	349.8	373.3	-6.29	349.7	0.02	
4590	11.05.2014	07:56:42	131	6	349.6	373.3	-6.34	349.7	-0.02	
4591	11.05.2014	13:32:15	131	7	383.2	373.3	2.66	383.3	-0.02	
4592	11.05.2014	13:56:32	131	8	380.5	376.3	1.12	386.8	-1.64	
4593	11.05.2014	14:10:45	131	9	387.4	375.9	3.05	392.7	-1.35	
4594	11.05.2014	14:14:17	131	10	391.4	374.9	4.40	395.4	-1.01	
4595	11.05.2014	14:30:17	131	11	401.3	373.3	7.51	400.3	0.26	
4596	11.05.2014	14:33:43	131	12	400.9	373.3	7.41	400.6	0.07	
4597	11.05.2014	14:37:15	131	13	399.5	373.3	7.03	400.9	-0.35	
4598	11.05.2014	15:01:01	131	14	399.9	373.3	7.14	399.7	0.05	
4599	11.05.2014	15:04:27	131	15	397.1	377.8	5.11	399.8	-0.68	
4600	12.05.2014	06:30:48	132	1	370.6	368.5	0.56	370.6	0.00	
4601	12.05.2014	08:24:29	132	2	368.5	368.5	-0.01	368.0	0.14	
4602	12.05.2014	08:27:55	132	3	367.9	368.5	-0.18	368.0	-0.02	
4603	12.05.2014	08:31:22	132	4	367.3	368.5	-0.34	367.9	-0.17	
4604	12.05.2014	08:34:48	132	5	368.4	368.5	-0.04	367.9	0.13	
4605	12.05.2014	08:38:15	132	6	368.6	368.5	0.01	367.9	0.19	
4606	12.05.2014	08:41:41	132	7	368.4	368.5	-0.04	367.9	0.14	
4607	12.05.2014	08:45:08	132	8	365.8	368.5	-0.75	367.9	-0.57	
4608	12.05.2014	09:03:55	132	9	369.8	368.5	0.34	367.9	0.52	
4609	12.05.2014	09:07:21	132	10	367.3	368.5	-0.34	367.9	-0.16	
4610	12.05.2014	09:10:48	132	11	366.9	368.5	-0.45	367.9	-0.27	
4611	12.05.2014	10:18:39	132	12	369.2	368.5	0.18	368.6	0.17	





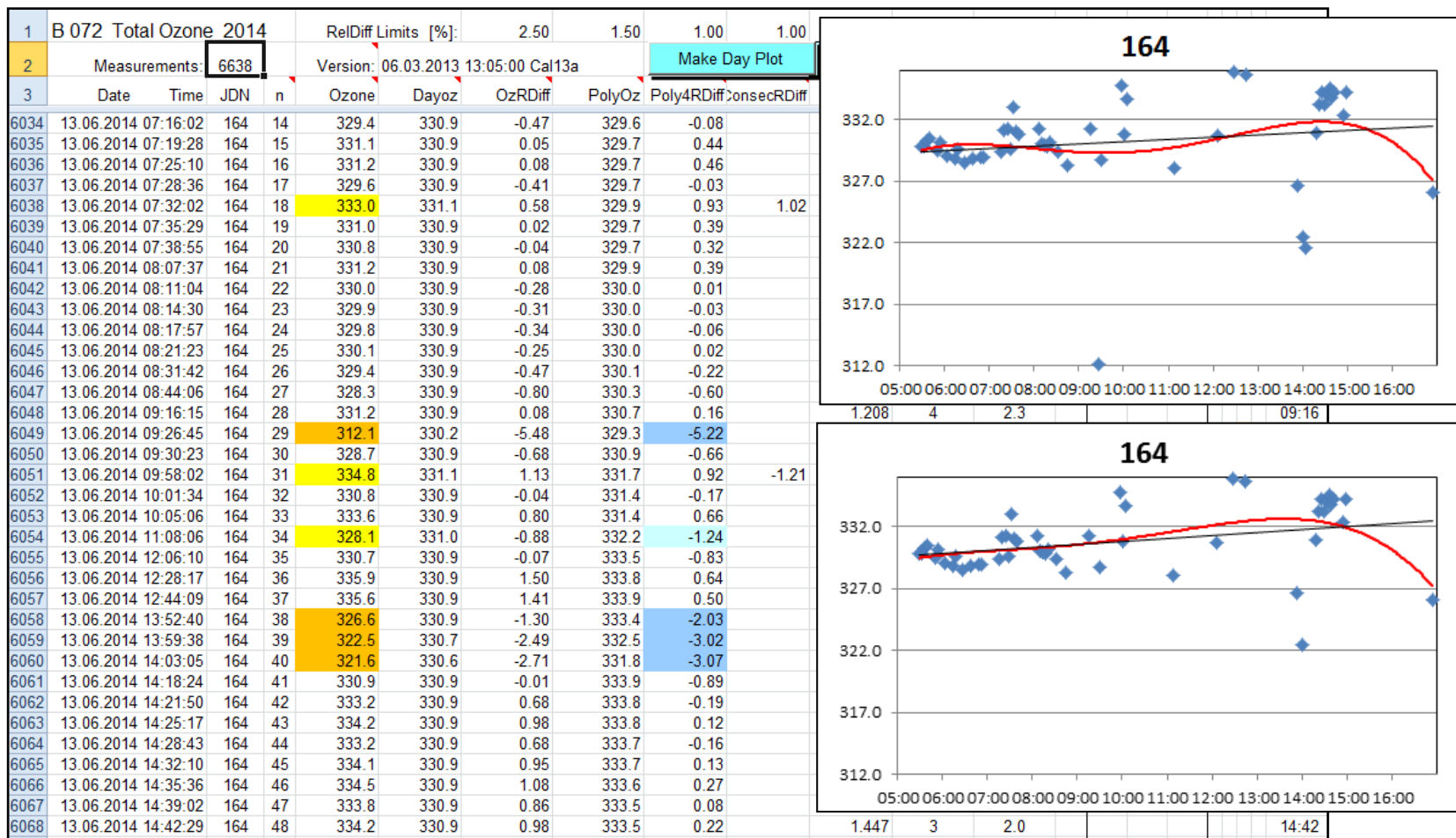
Results

1	B 072 Total Ozone 2014				RelDiff Limits [%]:		2.50	1.50	1.00	1.00
2	Measurements: 6638				Version: 06.03.2013		13:05:00 Cal13a		Make Day Plot	
3	Date	Time	JDN	n	Ozone	Dayoz	OzRDiff	PolyOz	Poly4RDiff	ConsecRDiff
6034	13.06.2014	07:16:02	164	14	329.4	330.9	-0.47	329.6	-0.08	
6035	13.06.2014	07:19:28	164	15	331.1	330.9	0.05	329.7	0.44	
6036	13.06.2014	07:25:10	164	16	331.2	330.9	0.08	329.7	0.46	
6037	13.06.2014	07:28:36	164	17	329.6	330.9	-0.41	329.7	-0.03	
6038	13.06.2014	07:32:02	164	18	333.0	331.1	0.58	329.9	0.93	1.02
6039	13.06.2014	07:35:29	164	19	331.0	330.9	0.02	329.7	0.39	
6040	13.06.2014	07:38:55	164	20	330.8	330.9	-0.04	329.7	0.32	
6041	13.06.2014	08:07:37	164	21	331.2	330.9	0.08	329.9	0.39	
6042	13.06.2014	08:11:04	164	22	330.0	330.9	-0.28	330.0	0.01	
6043	13.06.2014	08:14:30	164	23	329.9	330.9	-0.31	330.0	-0.03	
6044	13.06.2014	08:17:57	164	24	329.8	330.9	-0.34	330.0	-0.06	
6045	13.06.2014	08:21:23	164	25	330.1	330.9	-0.25	330.0	0.02	
6046	13.06.2014	08:31:42	164	26	329.4	330.9	-0.47	330.1	-0.22	
6047	13.06.2014	08:44:06	164	27	328.3	330.9	-0.80	330.3	-0.60	
6048	13.06.2014	09:16:15	164	28	331.2	330.9	0.08	330.7	0.16	
6049	13.06.2014	09:26:45	164	29	332.1	330.2	-5.48	329.3	-5.22	
6050	13.06.2014	09:30:23	164	30	328.7	330.9	-0.68	330.9	-0.66	
6051	13.06.2014	09:58:02	164	31	334.8	331.1	1.13	331.7	0.92	-1.21
6052	13.06.2014	10:01:34	164	32	330.8	330.9	-0.04	331.4	-0.17	
6053	13.06.2014	10:05:06	164	33	333.6	330.9	0.80	331.4	0.66	
6054	13.06.2014	11:08:06	164	34	328.1	331.0	-0.88	332.2	-1.24	
6055	13.06.2014	12:06:10	164	35	330.7	330.9	-0.07	333.5	-0.83	
6056	13.06.2014	12:28:17	164	36	335.9	330.9	1.50	333.8	0.64	
6057	13.06.2014	12:44:09	164	37	335.6	330.9	1.41	333.9	0.50	
6058	13.06.2014	13:52:40	164	38	326.6	330.9	-1.30	333.4	-2.03	
6059	13.06.2014	13:59:38	164	39	322.5	330.7	-2.49	332.5	-3.02	
6060	13.06.2014	14:03:05	164	40	321.6	330.6	-2.71	331.8	-3.07	
6061	13.06.2014	14:18:24	164	41	330.9	330.9	-0.01	333.9	-0.89	
6062	13.06.2014	14:21:50	164	42	333.2	330.9	0.68	333.8	-0.19	
6063	13.06.2014	14:25:17	164	43	334.2	330.9	0.98	333.8	0.12	
6064	13.06.2014	14:28:43	164	44	333.2	330.9	0.68	333.7	-0.16	
6065	13.06.2014	14:32:10	164	45	334.1	330.9	0.95	333.7	0.13	
6066	13.06.2014	14:35:36	164	46	334.5	330.9	1.08	333.6	0.27	
6067	13.06.2014	14:39:02	164	47	333.8	330.9	0.86	333.5	0.08	
6068	13.06.2014	14:42:29	164	48	334.2	330.9	0.98	333.5	0.22	



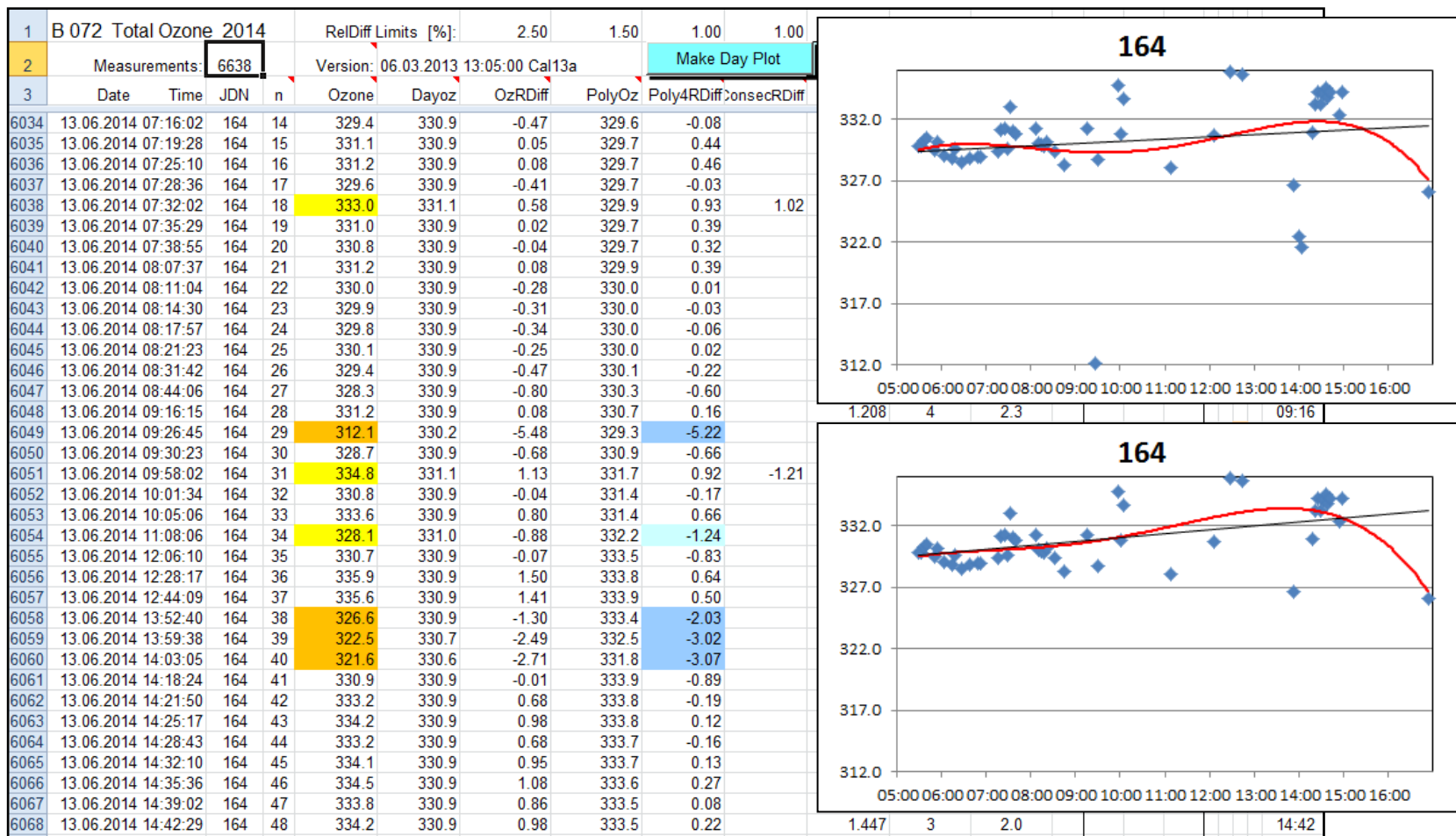


Results



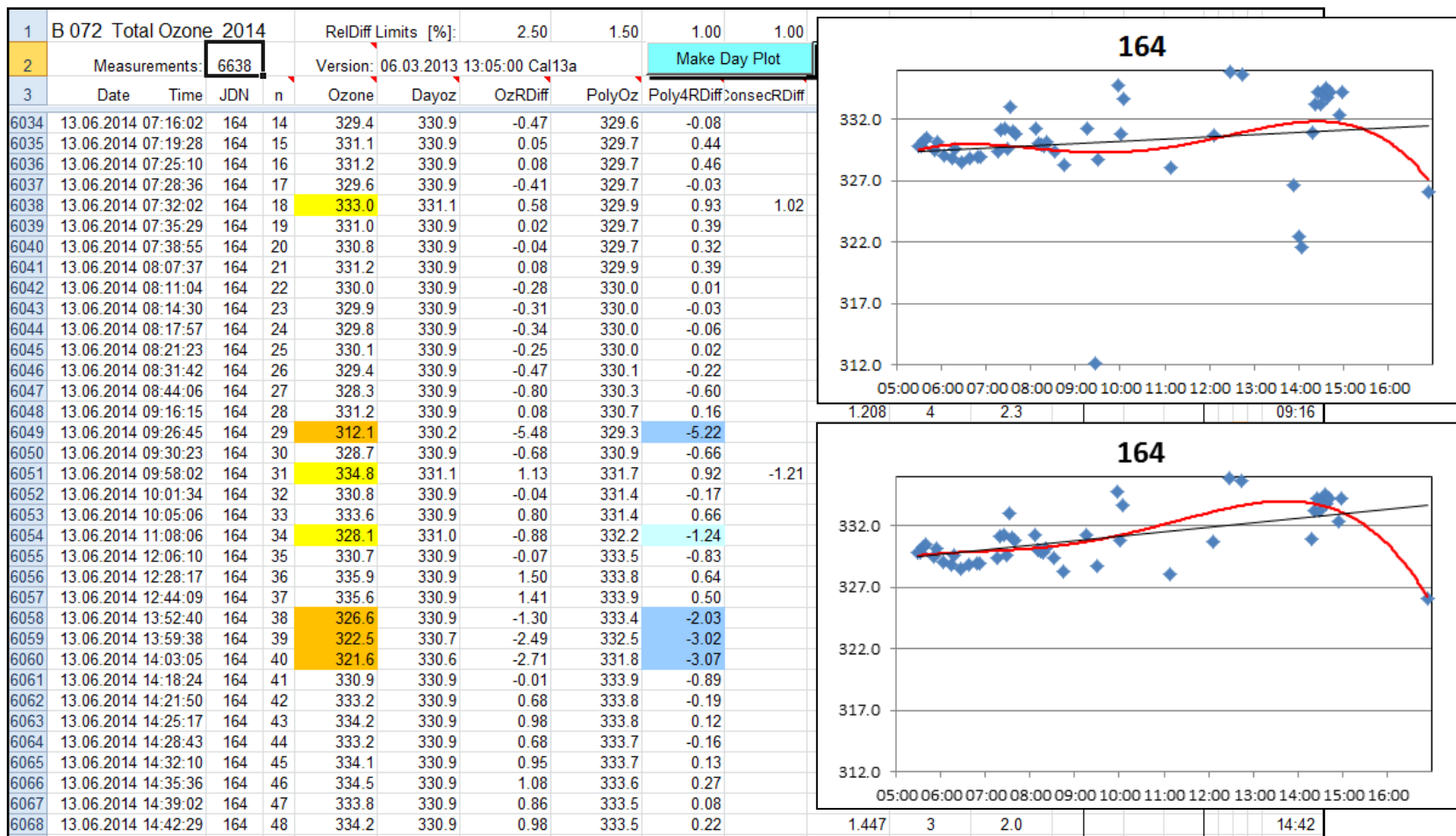


Results





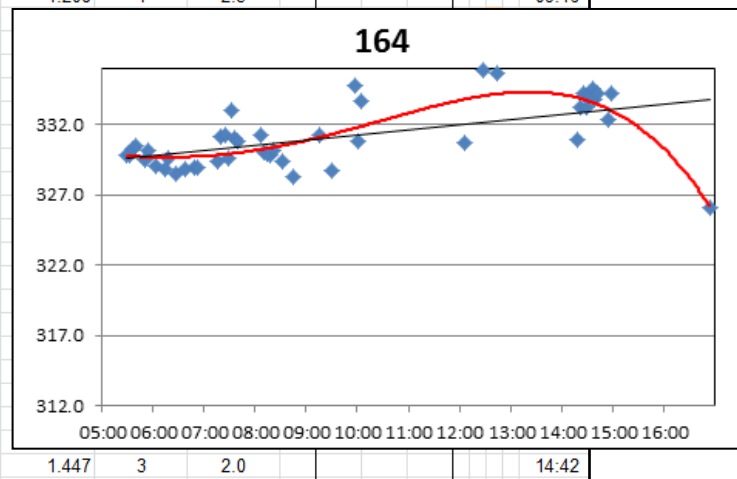
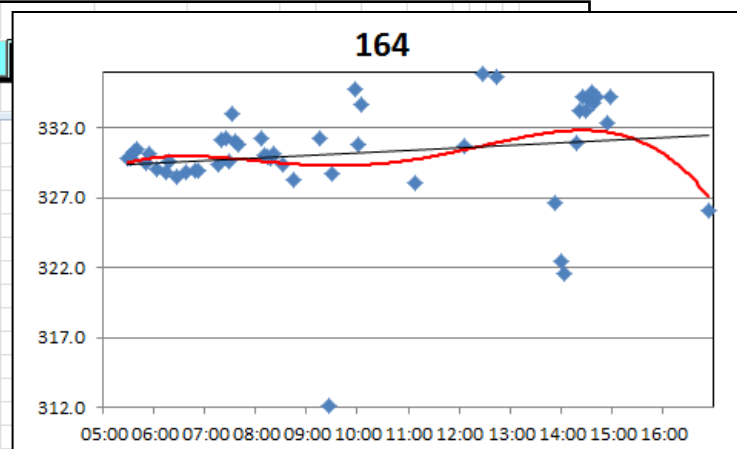
Results





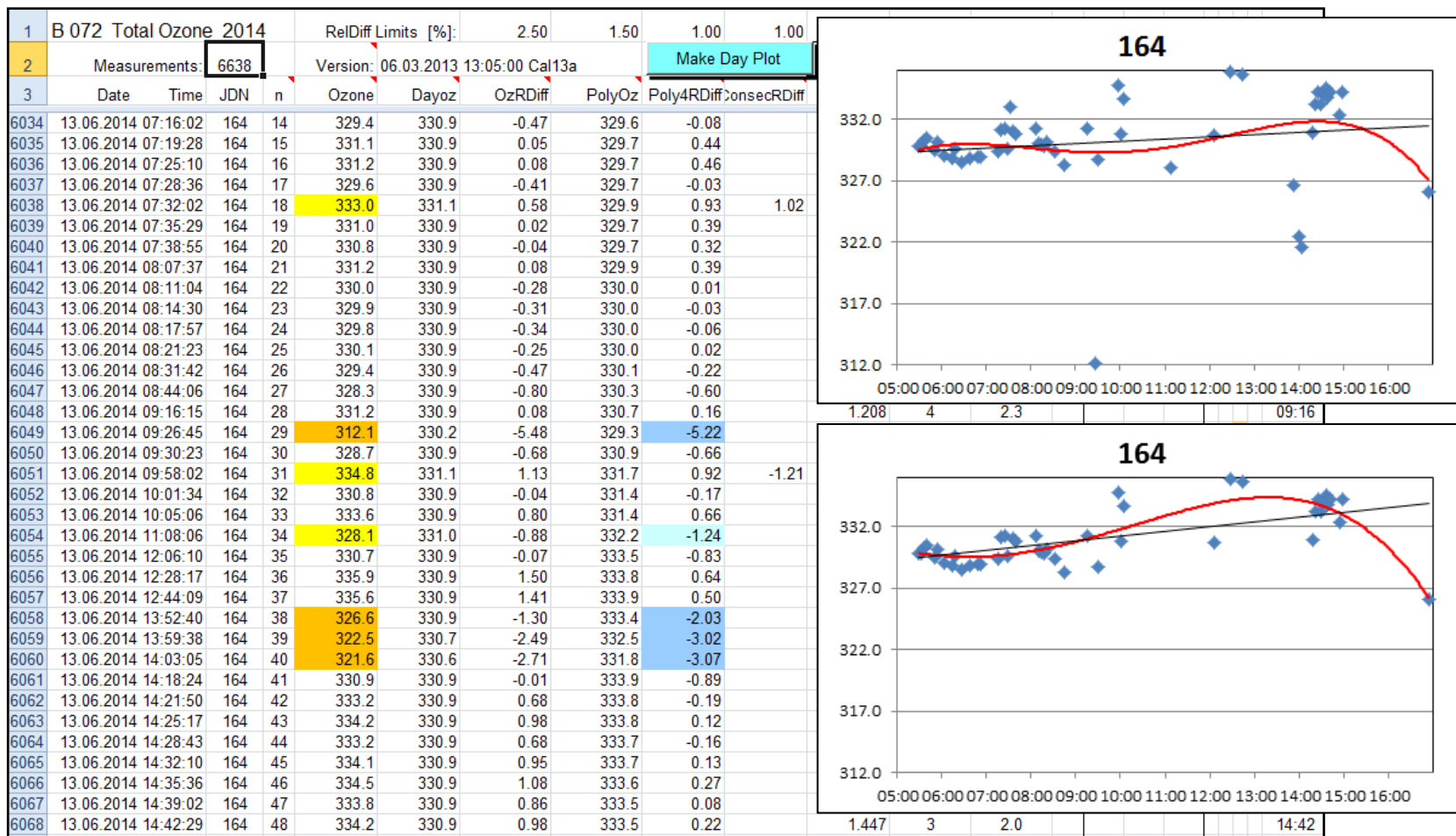
Results

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2	Measurements: 6638				Version: 06.03.2013		13:05:00 Cal13a		Make Day Plot	
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6034	13.06.2014	07:16:02	164	14	329.4	330.9	-0.47	329.6	-0.08	
6035	13.06.2014	07:19:28	164	15	331.1	330.9	0.05	329.7	0.44	
6036	13.06.2014	07:25:10	164	16	331.2	330.9	0.08	329.7	0.46	
6037	13.06.2014	07:28:36	164	17	329.6	330.9	-0.41	329.7	-0.03	
6038	13.06.2014	07:32:02	164	18	333.0	331.1	0.58	329.9	0.93	1.02
6039	13.06.2014	07:35:29	164	19	331.0	330.9	0.02	329.7	0.39	
6040	13.06.2014	07:38:55	164	20	330.8	330.9	-0.04	329.7	0.32	
6041	13.06.2014	08:07:37	164	21	331.2	330.9	0.08	329.9	0.39	
6042	13.06.2014	08:11:04	164	22	330.0	330.9	-0.28	330.0	0.01	
6043	13.06.2014	08:14:30	164	23	329.9	330.9	-0.31	330.0	-0.03	
6044	13.06.2014	08:17:57	164	24	329.8	330.9	-0.34	330.0	-0.06	
6045	13.06.2014	08:21:23	164	25	330.1	330.9	-0.25	330.0	0.02	
6046	13.06.2014	08:31:42	164	26	329.4	330.9	-0.47	330.1	-0.22	
6047	13.06.2014	08:44:06	164	27	328.3	330.9	-0.80	330.3	-0.60	
6048	13.06.2014	09:16:15	164	28	331.2	330.9	0.08	330.7	0.16	
6049	13.06.2014	09:26:45	164	29	332.1	330.2	-5.48	329.3	-5.22	
6050	13.06.2014	09:30:23	164	30	328.7	330.9	-0.68	330.9	-0.66	
6051	13.06.2014	09:58:02	164	31	334.8	331.1	1.13	331.7	0.92	-1.21
6052	13.06.2014	10:01:34	164	32	330.8	330.9	-0.04	331.4	-0.17	
6053	13.06.2014	10:05:06	164	33	333.6	330.9	0.80	331.4	0.66	
6054	13.06.2014	11:08:06	164	34	328.1	331.0	-0.88	332.2	-1.24	
6055	13.06.2014	12:06:10	164	35	330.7	330.9	-0.07	333.5	-0.83	
6056	13.06.2014	12:28:17	164	36	335.9	330.9	1.50	333.8	0.64	
6057	13.06.2014	12:44:09	164	37	335.6	330.9	1.41	333.9	0.50	
6058	13.06.2014	13:52:40	164	38	326.6	330.9	-1.30	333.4	-2.03	
6059	13.06.2014	13:59:38	164	39	322.5	330.7	-2.49	332.5	-3.02	
6060	13.06.2014	14:03:05	164	40	321.6	330.6	-2.71	331.8	-3.07	
6061	13.06.2014	14:18:24	164	41	330.9	330.9	-0.01	333.9	-0.89	
6062	13.06.2014	14:21:50	164	42	333.2	330.9	0.68	333.8	-0.19	
6063	13.06.2014	14:25:17	164	43	334.2	330.9	0.98	333.8	0.12	
6064	13.06.2014	14:28:43	164	44	333.2	330.9	0.68	333.7	-0.16	
6065	13.06.2014	14:32:10	164	45	334.1	330.9	0.95	333.7	0.13	
6066	13.06.2014	14:35:36	164	46	334.5	330.9	1.08	333.6	0.27	
6067	13.06.2014	14:39:02	164	47	333.8	330.9	0.86	333.5	0.08	
6068	13.06.2014	14:42:29	164	48	334.2	330.9	0.98	333.5	0.22	





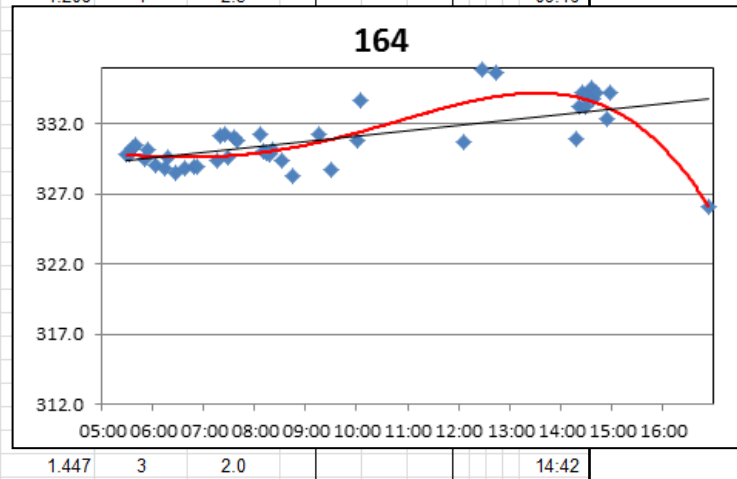
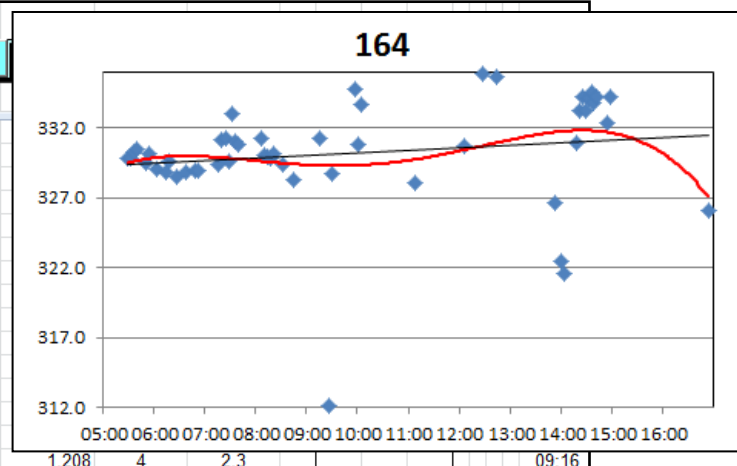
Results





Results

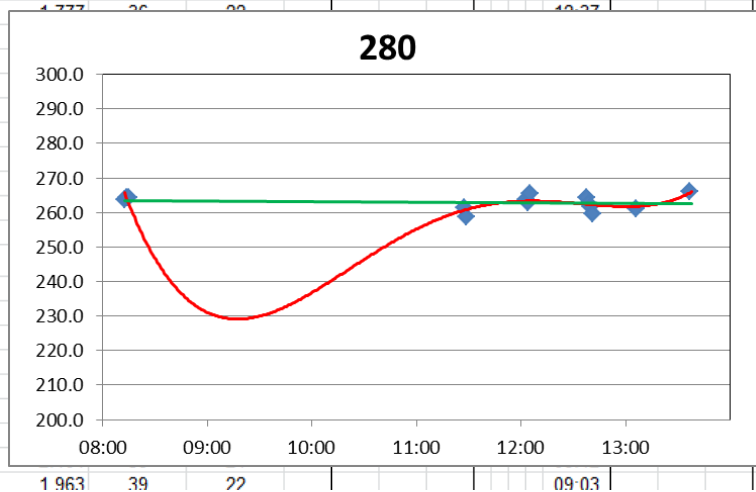
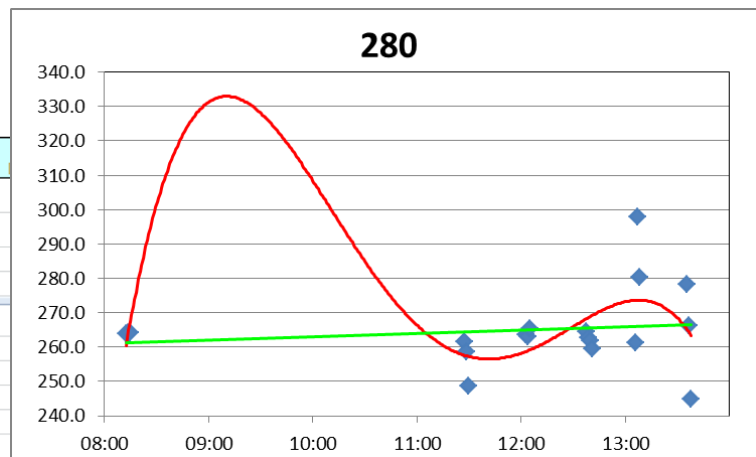
1	B 072 Total Ozone 2014				RelDiff Limits [%]:		2.50	1.50	1.00	1.00
2	Measurements: 6638				Version: 06.03.2013		13:05:00 Cal13a		Make Day Plot	
3	Date	Time	JDN	n	Ozone	Dayoz	OzRDiff	PolyOz	Poly4RDiff	ConsecRDiff
6034	13.06.2014	07:16:02	164	14	329.4	330.9	-0.47	329.6	-0.08	
6035	13.06.2014	07:19:28	164	15	331.1	330.9	0.05	329.7	0.44	
6036	13.06.2014	07:25:10	164	16	331.2	330.9	0.08	329.7	0.46	
6037	13.06.2014	07:28:36	164	17	329.6	330.9	-0.41	329.7	-0.03	
6038	13.06.2014	07:32:02	164	18	333.0	331.1	0.58	329.9	0.93	1.02
6039	13.06.2014	07:35:29	164	19	331.0	330.9	0.02	329.7	0.39	
6040	13.06.2014	07:38:55	164	20	330.8	330.9	-0.04	329.7	0.32	
6041	13.06.2014	08:07:37	164	21	331.2	330.9	0.08	329.9	0.39	
6042	13.06.2014	08:11:04	164	22	330.0	330.9	-0.28	330.0	0.01	
6043	13.06.2014	08:14:30	164	23	329.9	330.9	-0.31	330.0	-0.03	
6044	13.06.2014	08:17:57	164	24	329.8	330.9	-0.34	330.0	-0.06	
6045	13.06.2014	08:21:23	164	25	330.1	330.9	-0.25	330.0	0.02	
6046	13.06.2014	08:31:42	164	26	329.4	330.9	-0.47	330.1	-0.22	
6047	13.06.2014	08:44:06	164	27	328.3	330.9	-0.80	330.3	-0.60	
6048	13.06.2014	09:16:15	164	28	331.2	330.9	0.08	330.7	0.16	
6049	13.06.2014	09:26:45	164	29	332.1	330.2	-5.48	329.3	-5.22	
6050	13.06.2014	09:30:23	164	30	328.7	330.9	-0.68	330.9	-0.66	
6051	13.06.2014	09:58:02	164	31	334.8	331.1	1.13	331.7	0.92	-1.21
6052	13.06.2014	10:01:34	164	32	330.8	330.9	-0.04	331.4	-0.17	
6053	13.06.2014	10:05:06	164	33	333.6	330.9	0.80	331.4	0.66	
6054	13.06.2014	11:08:06	164	34	328.1	331.0	-0.88	332.2	-1.24	
6055	13.06.2014	12:06:10	164	35	330.7	330.9	-0.07	333.5	-0.83	
6056	13.06.2014	12:28:17	164	36	335.9	330.9	1.50	333.8	0.64	
6057	13.06.2014	12:44:09	164	37	335.6	330.9	1.41	333.9	0.50	
6058	13.06.2014	13:52:40	164	38	326.6	330.9	-1.30	333.4	-2.03	
6059	13.06.2014	13:59:38	164	39	322.5	330.7	-2.49	332.5	-3.02	
6060	13.06.2014	14:03:05	164	40	321.6	330.6	-2.71	331.8	-3.07	
6061	13.06.2014	14:18:24	164	41	330.9	330.9	-0.01	333.9	-0.89	
6062	13.06.2014	14:21:50	164	42	333.2	330.9	0.68	333.8	-0.19	
6063	13.06.2014	14:25:17	164	43	334.2	330.9	0.98	333.8	0.12	
6064	13.06.2014	14:28:43	164	44	333.2	330.9	0.68	333.7	-0.16	
6065	13.06.2014	14:32:10	164	45	334.1	330.9	0.95	333.7	0.13	
6066	13.06.2014	14:35:36	164	46	334.5	330.9	1.08	333.6	0.27	
6067	13.06.2014	14:39:02	164	47	333.8	330.9	0.86	333.5	0.08	
6068	13.06.2014	14:42:29	164	48	334.2	330.9	0.98	333.5	0.22	





Results

1	D 101 AD Total Ozone 2013				RelDiff Limits [%]:	2.70	1.50	1.50	1.50
2	Measurements: 4420				Version: 30.07.2013 11:02:28 Cal13a	Make Day Plot			
3	Date	Time	JDN	n	Ozone	Dayoz	OzRDiff	PolyOz	Poly4RDiff ConsecRDiff
4	01.01.2013	09:39:28	001	1	311.6	326.6	-4.59	312.7	-0.34
5	01.01.2013	09:40:53	001	2	314.1	326.6	-3.83	312.7	0.43
6	01.01.2013	10:04:59	001	3	314.7	326.6	-3.64	314.7	0.00
1062	07.10.2013	08:12:19	280	1	263.8	262.9	0.35	265.8	-0.76
1063	07.10.2013	08:13:48	280	2	264.3	262.9	0.54	263.9	0.17
1064	07.10.2013	08:14:50	280	3	264.2	262.9	0.50	262.5	0.63
1065	07.10.2013	11:27:16	280	4	261.5	262.9	-0.52	260.7	0.32
1066	07.10.2013	11:28:21	280	5	258.7	262.9	-1.59	260.8	-0.81
1067	07.10.2013	11:29:26	280	6	248.8	263.0	-5.38	257.5	-3.39
1068	07.10.2013	12:02:47	280	7	263.7	262.9	0.31	263.3	0.15
1069	07.10.2013	12:04:05	280	8	263.0	262.9	0.05	263.3	-0.12
1070	07.10.2013	12:05:22	280	9	265.4	262.9	0.96	263.3	0.79
1071	07.10.2013	12:37:49	280	10	264.4	262.9	0.58	262.4	0.77
1072	07.10.2013	12:38:58	280	11	262.6	262.9	-0.11	262.3	0.11
1073	07.10.2013	12:40:11	280	12	261.8	262.9	-0.41	262.3	-0.18
1074	07.10.2013	12:41:12	280	13	259.6	262.9	-1.25	262.2	-1.00
1075	07.10.2013	13:06:06	280	14	261.2	262.9	-0.64	261.8	-0.22
1076	07.10.2013	13:07:05	280	15	298.0	265.9	12.08	274.1	8.71
1077	07.10.2013	13:08:16	280	16	280.4	264.0	6.22	267.9	4.66
1078	07.10.2013	13:35:45	280	17	278.2	263.9	5.42	271.3	2.54
1079	07.10.2013	13:36:59	280	18	266.1	262.9	1.23	265.7	0.15
1080	07.10.2013	13:38:07	280	19	244.9	264.8	-7.50	263.4	-7.01
1081	08.10.2013	07:31:05	281	1	266.8	267.9	-0.40	267.6	-0.31
1082	08.10.2013	07:32:17	281	2	268.2	267.9	0.12	267.5	0.25
1083	08.10.2013	07:33:17	281	3	267.7	267.9	-0.06	267.4	0.10
1084	08.10.2013	08:05:25	281	4	265.3	267.9	-0.96	266.4	-0.41
1085	08.10.2013	08:06:34	281	5	266.1	267.9	-0.66	266.4	-0.12
1086	08.10.2013	08:07:39	281	6	267.7	267.9	-0.06	266.5	0.47
1087	08.10.2013	08:40:17	281	7	268.0	267.9	0.05	268.4	-0.15
1088	08.10.2013	08:41:33	281	8	269.6	267.9	0.65	268.5	0.41
1089	08.10.2013	08:42:39	281	9	268.3	267.9	0.16	268.6	-0.11
1090	08.10.2013	09:03:12	281	10	270.2	267.9	0.87	269.6	0.23

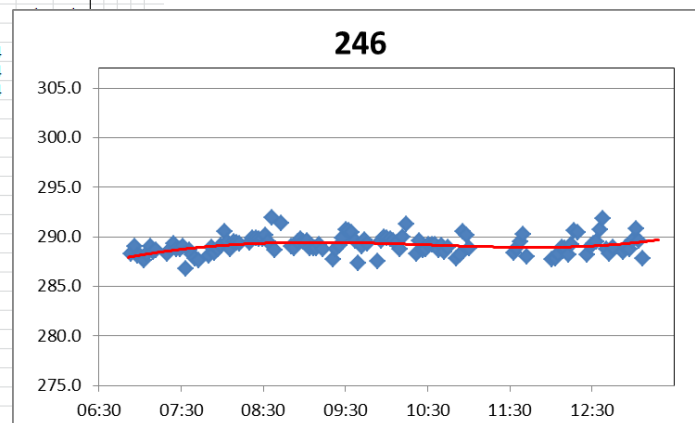
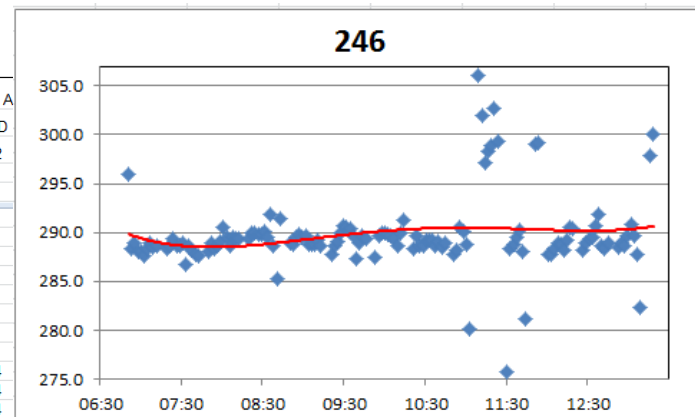




Results

1	D 062 AD Total Ozone 2013										RelDiff Limits [%]	2.70	1.50	1.50	1.50	01.01.2013	31.12.2013		
2	Measurements: 12897										Version: 30.07.2013	11:02:25	Cal13a	Make Day Plot		Delete DayPlots	41275	41639	A
3	Date	Time	JDN	n	Ozone	DayOz	OzRDiff	PolyOz	Poly4RDiff	ConsecRDiff	Airmass	Sun	Temp	FP	AD				
4	01.01.2013	09:43:29	001	1	284.4	326.2	-12.80	298.0	-4.55		3.392	33	21	2	2				
5	01.01.2013	09:46:48	001	2	307.3	328.4	-6.42	308.3	-0.31		3.351	73	21						
6	01.01.2013	09:48:54	001	3	307.9	328.4	-6.23	309.3	-0.44		3.325	73	21						
0240	03.09.2013	10:40:04	246	85	289.1	289.1	0.00	289.1	-0.01		1.309	33	25						
0241	03.09.2013	10:42:22	246	86	288.5	289.1	-0.21	289.1	-0.21		1.307	33	25						
0242	03.09.2013	10:44:41	246	87	288.9	289.1	-0.07	289.1	-0.07		1.305	33	25						
0243	03.09.2013	10:51:14	246	88	287.8	289.1	-0.45	289.1	-0.44		1.300	33	25						
0244	03.09.2013	10:53:34	246	89	288.2	289.1	-0.31	289.1	-0.30		1.299	33	25						
0245	03.09.2013	10:55:52	246	90	290.5	289.1	0.48	289.1	0.50		1.298	33	25						
0246	03.09.2013	10:58:11	246	91	290.1	289.1	0.35	289.0	0.36		1.296	33	25						
0247	03.09.2013	11:00:29	246	92	288.8	289.1	-0.10	289.0	-0.08		1.296	33	25						
0248	03.09.2013	11:02:47	246	93	280.2	289.5	-3.22	289.9	-3.33		1.294	33	25	5	4				
0249	03.09.2013	11:09:41	246	94	306.0	289.7	5.61	290.5	5.34		1.293	33	25	1	4				
0250	03.09.2013	11:11:58	246	95	301.9	289.6	4.24	290.1	4.05		1.292	33	25	4	4				
0251	03.09.2013	11:14:15	246	96	297.2	289.3	2.74	288.5	3.02		1.292	33	25	12	4				
0252	03.09.2013	11:16:33	246	97	298.3	289.3	3.11	288.9	3.24		1.291	33	25	10	4				
0253	03.09.2013	11:18:51	246	98	298.9	289.4	3.29	289.2	3.35		1.291	33	25	9	4				
0254	03.09.2013	11:21:10	246	99	302.7	289.7	4.48	290.5	4.21		1.291	33	26	3	4				
0255	03.09.2013	11:23:28	246	100	299.4	289.6	3.38	290.1	3.22		1.291	33	26	6	4				
0256	03.09.2013	11:30:28	246	101	275.7	289.6	-4.80	290.0	-4.94		1.292	33	26	2	4				
0257	03.09.2013	11:32:47	246	102	288.4	289.1	-0.24	288.9	-0.19		1.293	33	26						
0258	03.09.2013	11:35:05	246	103	288.8	289.1	-0.10	288.9	-0.05		1.293	33	26						
0259	03.09.2013	11:37:23	246	104	289.5	289.1	0.14	288.9	0.20		1.294	33	26						
0260	03.09.2013	11:39:42	246	105	290.2	289.1	0.38	288.9	0.44		1.295	33	26						
0261	03.09.2013	11:42:01	246	106	288.0	289.1	-0.38	288.9	-0.32		1.296	33	26						
0262	03.09.2013	11:44:18	246	107	281.1	289.2	-2.81	287.9	-2.35		1.298	33	26	13	4				
0263	03.09.2013	11:51:10	246	108	299.0	289.4	3.30	289.3	3.35		1.302	33	26	8	4				
0264	03.09.2013	11:53:28	246	109	299.2	289.5	3.34	289.7	3.29		1.303	33	26	7	4				
0265	03.09.2013	12:00:55	246	110	287.7	289.1	-0.49	288.9	-0.43		1.309	33	26						
0266	03.09.2013	12:03:14	246	111	287.8	289.1	-0.45	288.9	-0.39		1.312	33	26						
0267	03.09.2013	12:05:33	246	112	288.3	289.1	-0.28	288.9	-0.22		1.313	33	26						
0268	03.09.2013	12:07:52	246	113	288.9	289.1	-0.07	289.0	-0.02		1.316	33	26						
0269	03.09.2013	12:10:11	246	114	288.8	289.1	-0.10	289.0	-0.06		1.319	33	26						
0270	03.09.2013	12:12:28	246	115	288.2	289.1	-0.31	289.0	-0.27		1.321	33	26						
0271	03.09.2013	12:14:45	246	116	289.2	289.1	0.03	289.0	0.08		1.323	33	26						
0272	03.09.2013	12:17:05	246	117	290.6	289.1	0.52	289.0	0.55		1.326	33	26						
0273	03.09.2013	12:19:24	246	118	289.3	289.1	-0.09	289.0	-0.05		1.329	33	26						
0274	03.09.2013	12:21:43	246	119	289.3	289.1	-0.09	289.0	-0.05		1.339	33	26						
0275	03.09.2013	12:24:02	246	120	289.3	289.1	-0.09	289.0	-0.05		1.343	33	26						
0276	03.09.2013	12:31:08	246	121	289.3	289.1	0.07	289.1	0.08		1.346	33	26						
0277	03.09.2013	12:33:26	246	122	289.5	289.1	0.14	289.1	0.14		1.350	33	26						
0278	03.09.2013	12:35:45	246	123	289.5	289.1	0.55	289.1	0.55		1.355	33	26						
0279	03.09.2013	12:38:04	246	124	289.5	289.1	0.93	289.1	0.92		1.359	33	26						
0280	03.09.2013	12:40:22	246	125	288.7	289.1	-0.14	289.1	-0.16		1.363	33	26						
0281	03.09.2013	12:42:40	246	126	288.3	289.1	-0.28	289.2	-0.30		1.367	33	26						

About 66% of outliers detected!





Conclusions

- Variability of reference curves allows to use the tool for different datasets
- About 66% of the outliers are detected
- Dobsons: Outliers are detected on the level of single wavelengths (C, D, A) rather than wavelength pairs (AD, CD)
- Problem: No information is made of the others instruments measurements

→ Detection method should be applicable on a group of instruments



Applying detection method on a group of instruments: open questions

- Use of one instrument as a reference, shifting the others ?
- Use all instruments as **one** dataset ?
- Use other instruments just as an auxiliary information ?

How can autoflag method linked with a database ?



Thank
you
for
your
attention
...