

CLUB ITALIANO del COLOMBACCIO

Woodpigeons' (*Columba palumbus*) autumn migration in Central and Northern Italy along two flyways monitored (*consecutive 7 years*) in eight crucial spots by eight Observers and uniform method .

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ABSTRACT

On the base of precedent papers and monography (1-2-3-4-8) by present retroactive research, data recorded (2000-2006) by 8 Observers-registrars in 8 spots sites along two main migration flyways in Italy are analysed to study the volume , timing , behaviours of Woodpigeons (*Columba palumbus*) migrating in Italy in Autumn . The two routes are one in Central Italy (trans-Appenines mountains) and an other in Northern Italy from the Eastern "way-in" to West Liguria gulf along Padania Valley. A total number of 443.210 woodpigeons and 7.077 flocks were monitored and recorded in 7 years : seasonal peaks and waves of the migration were analysed in details . Many results of the present retroactive research confirm the results and interpretations of precedent papers (1-2-3-4) also concerning the relationships with abiotic factors (meteo) . Some intepretations of particular factors of the migratory phenomenon seem quite new :

- uniform analysis along specific flyways and uniform long time collection of data by uniform methods ;

- seasonal timing and daily timing of the Migration connected with specific latit./longit. sites (way-in,transit,way-out)

- sizes of flocks during the transit (arrivals,transit,departures)

The **flexibility** of the WP for migration's choices of the various populations is a dominant character of this migrating species ,also depending on the origins of the populations wich remain -for Italy - a problem to be better investigated (5).

Flexibility to organize and performing the autumn migration travel to Italy ,seems the main eco-sensitive character of the Species *Columba palumbus* .

Further studies will be planned according to the aims of Club Italiano del Colombaccio and its Members .

Key-words : Woodpigeons (WP) , Flyway (Fw),Peaks/waves (PW) ,flocks size,Air Pressure (AP),migration , timing , abiotic biotic factors.

INTRODUCTION

The base of the present Paper is a preliminary report " Woodpigeons' autumn migration in Italy monitored (consecutive 19 years) in a single crucial spot by single Observer and uniform method " (*Cavina E.-Cenni P. : preliminary report - IJWR - vol.1,2018 or Science Heresy Ornithology*

<http://www.scienceheresy.com/ornithologyheresy/index.html>)

where the collected data (107.263 birds and 3367 flying flocks and 48 peaks/waves) offered a special emblematic overview about the pattern of the WP Species' migration through the Italian Peninsula , showing a full picture of the migration dynamics quite valid for all the Central Italy area .



Fig.1 - Numbers of Woodpigeons (WP) recorded in 19 years (1999-2017) (1)

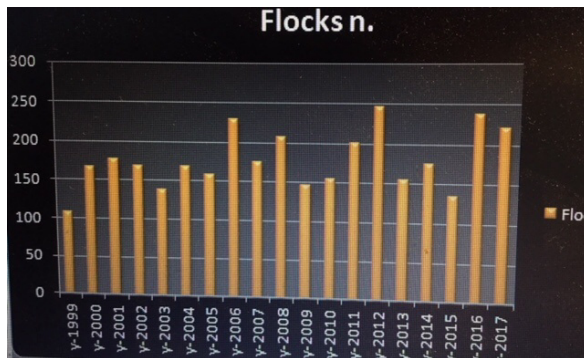


Fig-2 - Numbers of flocks (1)

Flocks size	Total	h 7-11 Peaks	h 11-14 total Peaks	h 14-18 total Peaks
1-10	21,76 %	9,68	15,07	7,92
11-50	65,21	64,14	68,60	57,92
51-100	7,78	5,29	10,18	14,43
101-300	8,34	15,43	11,22	8,13
>300	2,46	0,45	1,76	0,40
			0,7	1,06

Fig-3 - Flocks : analysis % (1) of 3367 flying flocks for 107.263 birds WP and 48 (PW) peaks/waves concerning sizes of the flocks and timing of transit (1999-2017)

Integrating and deepening the same data ,we have enlarged the analysis and overview about Central and Northern Italy's migration flyways/routes by examination of safe data collected by few Observers (5+3) all of them using the same method recording continuously 7 years (2000-2006) of autumn migration of woodpigeons and specific counting method over flocks between 10-5/600 m distance as by <https://www.fws.gov/waterfowlsurveys/forms/counting.jsp?menu=counting> <https://www.thespruce.com/how-to-count-birds-386687> All these Observers have taken part in Progetto Colombaccio (1998-2007) and offered their recording-hand-books for the present retroactive research .

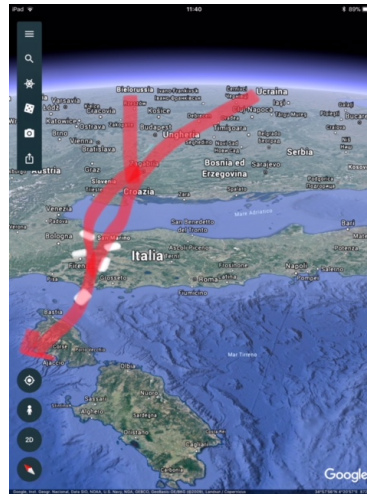
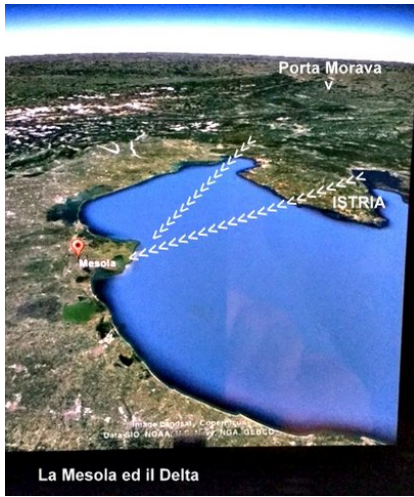


Fig.4 -(A-B) - Migration flyway and five (white point) Observations' spots

It seems - also by suggestions of expert Researchers in "migration" (Birds Migration Research Foundation) - that an analysis by data collected continuously by few same diligent Observers using same recording method , in the same observation's site, in the same days of the same migration season , in the same larger geographic area and selected spots subjected by same general weather and isobaric conditions , along a traditional same flyway/route extended for more than 200 km , should be able to offer best results concerning the knowledge of the migration behaviours and related stable or changing habits , also depending on climate changes during a long period more than 5 years .

On the other hand , other methods for monitoring Autumn migration in Italy have been developed by the " Club Italiano del Colombaccio " (papers as by IJWR vol.1-2018-index) as Progetto Colombaccio (1999-2007) , Progetto Colombaccio Italia (2008-2018) , Monitoraggio Selettivo Migrazione MSM (2017), Wood pigeons wintering in Mesola forest (2017-18), and last Monitoraggio Colombaccio Live MCL (2017) supported by modern smart-technologies and related daily maps as by <http://birdcast.info/live-migration-maps/> .

All these ancient and modern methods result extremely efficient offering a lot of data and indications useful for the study of the wood pigeons' migration . The defects of these ancient and modern methods could be identified in " repeated same records , various observers and applied methods , discontinue days' observation " .

A modern guide to correct migration analysis is "*Steps for basic analysis of daily migration counts*

<http://www.oiseauxcanada.org/download/CMMNmigrationanalysisguide.pdf> "

Howether in our experience , the results of these methods should be integrated with the results of the present retroactive extremely selective study , also avoiding too sophisticated statistical methods too often far to the simple "evidence based" reality .

MATERIALS and METHOD

We have considered a first flyway / route which from Adriatic coast (from Po Delta-Mesola forest Latitudine: 44.921919 | Longitudine: 12.229752 - to Rimini - south 100 Km +/-) is directed to the Appenine Mountains as a funnel to a hilly segment of 7-8 Km through the valleys of the rivers Montone (south) and Lamone (north) Marzeno and Tramazzo in front of the Mountains' Pass of Muraglione(south) and Marradi (north) on the border between Romagna-Tuscany regions , before the Tuscany's valleys on the west side of Appenine Mountains (altitudes around 1000-1200 m .) .

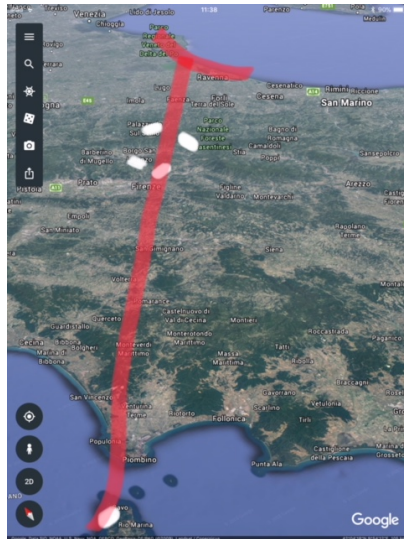


Fig.5 -Route from Delta-Mesola area to Elba island crossing Appennines mountains

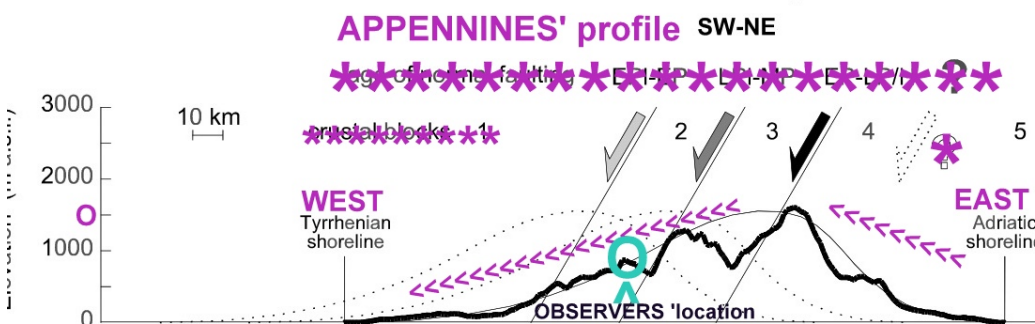


Fig. 5 bis - Profile East-West of flyway over Appennines mountains from Adriatic to Tirrenian coast.

On the eastern side of the Apennine Mountains , at the tip of the funnel the extreme observation's sites are **Monte Paolo** (south - Lat. 44°9'15.59 N-Long.11°52'48.14 E) and **Tredozio** (north -Lat. 44°5'10.04 N - Long.11°44'54.28 E) distant between themselves 7,5 Km .

After crossing of the Mountains and Pass (area Muraglione-Marradi) the flyway is opened to the rivers' large valleys (Sieve-Arno) and hills of Tuscany and the observation's sites are located in **Londa** (south- Lat.43°51'18.48 N- Long.11°36'15.85 E)) and **Borgo s.Lorenzo "il Lago"** (north) in the Mugello area (Lat.43°27'31.89 N - Long.11°26'54.57 E) , an "highway" directed to the "terminal" bridge on the Tirrenian sea (western flyways to Corsica-Sardinia-Spain-North Africa) as in Baratti gulf/Populonia (archelologic Etruscan site) - **Elba island** (Lat. 42°46'41.47 N- Long. 10°11'33.86E) last observation's site of our study . (following **Fig.6 - A-B**)



The eastern way from Adriatic coasts to Appenine sites is 70-90 Km long , and from here to Elba island the flyway is around 150-160 Km : total distance from Adriatic to Tirrenian coasts is around 230-250 Km . Many local observations "real time " (telephone connections) indicate that on this flyway the speed of woodpigeons is in average range 60-70 Km/h (higher depending on winds) that corresponds 3-4 hours of fly from the Adriatic to Tyrrenian coasts .

From 5 selected observation's sites (Monte Paolo & Tredozio at eastern side ,Londa & Mugello ("il Lago") at western side of Appenine safe data collected by 5 expert diligent Observers all of them using the same method recording continuously 7 years (2000-2006) of autumn migration of woodpigeons during 151 days of observation in Appennines eastern aeras , 134 days of observation in Appennines western areas and 179 days in Elba island ,where the November migration's season is longer : average 22 days for one Season , min.15 -max.36 .Considering the global time spent daily in observation & recording we have documented data from Mugello "il Lago"site , where the total hours were 1164 in 7 years (2000-2006) in 136 days wich is 8,5 h/day .

Four Observers (hunters) in the Appennines Mountains area (2 in Romagna at East - 2 in Mugello Tuscany at West) have recorded by the same method 1549 flocks and 49.937 woodpigeons on the Eastern Appennines side in 7 years , and 2369 flocks and 50.173 woodpigeons on the Western Appennines side : the flocks cannot be superimposed on the 2+2 sites . It seems accetable to interpret : the mass of woodpigeons arriving in front of the mountains is fragmented in more numbers of flocks after crossing the mountains . We must consider that the single counts of the single observers are performed at a visual distance of no more 500-600 m . : other higher flocks in altitude are not counted and these flocks , usually big flocks of hundreds and thousands birds cross the mountains in high altitude corridors , without fragmentation and very probably these flocks arrive directly from the Adriatic crossing .

Last observer (n.5) at the crossing Central Italy flyay-corridor is located on the north-west side of the ELBA little island , close to Populonia-Baratti Gulf (Tuscany's coast) . This is the main "Terminal" of the all flyways crossing Central Italy from the Adriatic sea , receiving also most important migrating mass arriving from the North (Liguria) along the Tirrenian coast where the woodpigeons meet the forest of S.Rossore Migliarino (close to Pisa) as great stop-over site . The woodpigeons recorded on the corridor examined in this paper , represent 22 % of all the mass (231.832 birds) crossing Elba island in the same period of 7 years .



In the map (Fig.7) the corridor - flyway (white) respect other flyways arriving in Elba area, and collecting 22% respect 78% of woodpeckers (231.832 total) recorded in Elba island 2000-2006 (7 years) before crossing Tyrrhenian sea.

The summary- details of the over exposed data are as following in Fig.8

	2000	2001	2002	2003	2004	2005	2006
M.PAULO	3879	2992	4352	1420	1049	1996	4979
	128	140	114	86	74	104	173
TREDOZIO	3173	5934	1821	3888	3713	3403	7341
	111	103	54	97	85	115	164
EST	7052	8926	6173	5305	4762	5399	12320
49.937	239	243	168	184	159	219	337
1549							
LONDA	5284	5069	4300	3336	3480	4768	8712
	167	177	168	138	168	158	229
B.S.LORENZO	3039	3840	3893	2887	3086	2605	3230
	111	201	160	112	151	119	156
OVEST	8323	8909	8193	4223	6566	7373	11942
50.173	278	378	328	250	319	277	385
2369							
ELBA island	38.126	49.441	22.171	30.013	29.355	26.160	26.059
231.832	344	355	285	307	372	351	331
2345							

LEGENDA : Corresponding to 4 observation's sites (2 at Eastern Appenines' side and 2 Western) on the first line we have numbers of woodpeckers counted and on the second line we have number of flocks . The total number in 7 years is equal around 50.000 woodpeckers observed in transit from Eastern (49.937 birds) to Western (50173) sides of Appenines Mountains and related flocks (1549-2369 flocks) . We must observe that for many single years the flocks preferred alternately the flight's line North or South (distance between themselves 7,5-10-20 km) of the corridor ,

probably related to the prevalence of winds . The average / years over the total in 7 years is $\langle 7151/y \rangle$ woodpigeons and the average /years over the flocks' totals of 7 years is $221 / y$ at East and $338/y$ at West . The differences between East and West counts must be related to the fragmentations of flocks during the transit over the mountains . The size (average) of flocks is 30-40 birds over the totals.

years	M.PAOLO	TREDOZ.	xxx	LONDA	B.S.Lore.
y-2000	3879	3173	0	5284	3039
y-2001	2992	5934	0	5069	3840
y-2002	4352	1821	0	4302	3893
y-2003	1420	3888	0	3336	2887
y-2004	1049	3713	0	3480	3086
y-2005	1996	3403	0	4768	2605
y-2006	4979	7341	0	8712	3230

Fig.9 - Total numbers crossing Appenines mountains , recorded on two East-sites (M.Paolo-Tredozio) and two West-sites (Londa-B.go S.Lorenzo)

Fig.10- Total numbers WP crossing Appenines mountains , recorded on two East- sites (M.Paolo-Tredozio) and two West-sites (Londa-B.go S.Lorenzo) (2000-2006)

Fig.11- Total number of Flocks crossing Appenines mountains , recorded on two East- sites (M.Paolo-Tredozio) and two West-sites (Londa-B.go S.Lorenzo) (2000-2006)

Regarding the timing of the transit all over the area of the corridors , in 7 years in 133-151 days of recording ,we have calculated 70% (7-11 h) - 17 % (11-14 h .) - 13 % (after 14 h .) . This item is supported by a special re-examination of all the daily data of a single site (Londa) where the collected data permit a full deatiled review over 19 years (1999-2017) of monitoring of 107.253 birds in 3367 fighting flocks and corrispective 48 peaks/waves . "Londa"'s item will be reported in "Discussion" of the present text.

<i>Flocks</i>	<i>h 7-11</i>		<i>h 11-14</i>		<i>h 14-18</i>	
<i>size</i>	<i>Total</i>	<i>Peaks</i>	<i>total</i>	<i>Peaks</i>	<i>total</i>	<i>Peaks</i>
<i>1-10</i>	21,76 %	9,68	15,07	7,92	17,22	14,76 %
<i>11-50</i>	65,21	64,14	68,60	57,92	58,80	66,84
<i>51-100</i>	7,78	5,29	10,18	14,43	17,22	8,02
<i>101-300</i>	8,34	15,43	11,22	8,13	6,41	8,37
<i>>300</i>	2,46	0,45	1,76	0,40	0,7	1,06

Fig.12- Flocks : analysis % (1) of 3367 fighting flocks for 107.263 birds WP and 48 (PW) peaks/waves concerning sizes of the flocks and timing of transit (1999-2017)

On the following Table we have collected the main *numbers* linked to the dates/days in October - November with the **peaks/waves (PW)** of the Migration in 7 years on the same flyway until the last site (Elba island) from where the woodpigeons continue (directly or after stop-over) the migration through the Mediterranean sea .

Fig.13-Numbers of Woodpigeons during Peaks/Waves on EAST and WEST Appenines in 7 years (2000-2006)

The data regarding the trans-Appennine flyways object of the present retroactive research , must be connected with the **northern flyway/route** from East (Veneto

Region) to the western French border of Italy and Liguria gulf after crossing Padania Valley . By the same method regarding Appennines flyway we have collected data for the northern flyway by one eastern observation's point (Monte di Malo) and two western points as Coronata Genova and one westerner 40 Km Bricco dei Corvi-Albissola (SV) .

The main route from EAST along the Padania Valley on the northern corridor close to Alps mountains receive also flows from Delta area and Mesola forest.

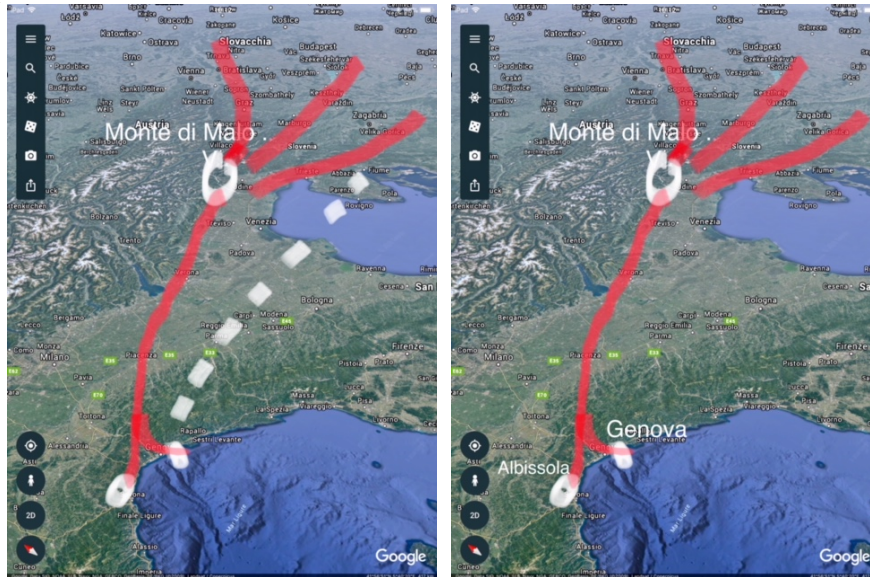


Fig.14 A-B

In the following Table we have collected data as woodpigeons number , flocks numbers, days of recording activities, size average :

	2000	2001	2002	2003	2004	2005	2006	
MONTE di MALO	7113	11.803	23.567	17.674	29.815	15.229	13.623	
VENETO	159	25 585	22 511	28 515	27 541	37 781	34 589	31
								Tot. 7 years 118.851 3581 size av.32 days 208
CORONAT A Genova	4843	4357	7126	7626	13.321	6664	9988	
	252	32 286	22 254	25 254	35 344	29 215	24 301	29
LIGURIA 1								Tot.7 years 53.925 1820 size av. 29 days 196
BRICCO dei CORVI (SV)	5967	2316	2482	5304	3506	2819	3826	
	166	30 148	21 137	24 211	21 63	28 140	21 148	21
LIGURIA 2								Tot.7 years 26.220 1013 size av. 26 days 166

Fig-19-Numbers WP recorded during PW of first 15 days October and after (1-2)in EAST site Monte di Malo and WEST sites Genova - Albissola

If we consider the **summary of Totals** of WP Numbers in 7 years and two Flyways (Northern and Central FW) we can check the following two tables

area	EAST	WEST 1	WEST 2
CENTRAL	49937	50173	231832
NORTH	118851	53925	26220

Fig-20

Fig-21 - Numbers of WP transit in Appennines'CENTRAL area at Eastern sites (M.Paolo-Tredozio) and Western sites (Londa-B.go S.Lorenzo as West1 , and West 2 Elba island) and NORTHERN FW at Eastern site (Monte di Malo) and Western 1-2 (Genova - Albissola)

The basic data now exposed represent the basic **Materials** of the present retroactive research , together with the data connected with the Weather and other abiotic factors (see Appendix Meteo) .

Concerning the **Methods** we underline what reported in in the "Introduction"

" It seems - also by suggestions of expert Researchers in "migration" (Birds Migration Research Foundation) - that an analysis by data collected continuously by few same diligent Observers using same recording method , in the same observation's site,in the same days of the same migration season , in the same larger geographic area subjected by same general weather and isobaric conditions , along a traditional same flyway/route extended for more than 300 km , should be able to offer best results concerning the knowledge of the migration behaviours and related stable or changing habits , also depending on climate changes during a long period more than 5 years .

On the other hand , other methods for monitoring Autumn migration in Italy have been developed by the " Club Italiano del Colombaccio " (papers as by IJWR vol.1-2018-index) as Progetto Colombaccio (1999-2007) , Progetto Colombaccio Italia (2008-2018) , Monitoraggio Selettivo Migrazione MSM (2017), Woodpigeons wintering in Mesola forest (2017-18) ,and last Monitoraggio Colombaccio Live MCL (2017) supported by modern smart-technologies and related daily maps as by <http://birdcast.info/live-migration-maps/> .

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migration counts

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Howether in our experience ,the results of these methods should be integrated with the results of the present retroactive extremely selective study , also avoiding too sophisticated statistical methods too often far to the simple "evidence based" reality .

RESULTS

During autumn migration of Woodpigeons crossing Italian Peninsula , for a long period of seven years (**2000-2007** , extracted from Progetto Colombaccio) , five (Central Italy) and three (Northern Italy) Observers / hunters -by the uniform same method - have recorded

- **443.210 woodpigeons**

- **7.077 flocks**

This is a total number of recorded observations , but we must consider that along the Central Italy's flyway/corridor on 3 different

"latitudinal/longitudinal" levels (Fig.6 A) , the flocks through the 3 levels have repeated passage : 49.937 at East , repeating 50.173 at West

Appennines' side without possibilities of crossing observations between themselves north-south (Treozio & B.go S.Lorenzo at north ,M.Paolo & Londa at south) .On the base of this criticism we can consider acceptable a number of 50.000 birds observed by 2+2 Observers in 7 years . The data from Elba island as "terminal" of the Appennines' corridor confirm that this "50.000" number is compatible with the numbers of Elba , but it represents 21,56% of the total 231.832 WP registered in Elba where other flyways/routes from North -North East flow together before crossing the sea . (Fig.5-6)

As basic results of the present retroactive research we have reported the global numbers as at the Fig. 20-21 , for the two (Central and Northern) flyways and Eastern and Western sites of recording . Trying to "read" at best the real dynamics of the migration's flows , we must consider the details offered by the Peaks/Waves (PW) as every season they happen (2-3 times) during autumn migration , and probably we can consider PW as a "thermometer" of the seasonal migration: the intensity's volume of the single PW should be indicative of the total force of the migration of a specific year. In the other paper (The Ring Vol.40,2018, ISSN 0035-5429,e-2083-3520) (2f) we have discussed the PW item *"We have here five or six groups of pigeons passing Italy in different parts of autumn and the time of the passage including a few peak days is quite well stable between years . Yearly peaks in different waves , as well as the waves themselves are not regularly at the same relative volumes,but this normal that different groups have own number size and migration dynamics "* and also concluding the paper *"...we need more data -from more years and more sites in regions -to be able to draw detail picture of the wave and population structure of pigeons migration "* .

The present research is alligned to this aim .

Many PW were extracted from records in 8 sites by 8 Observers : 87 PW in Central Italy and 31 North Italy , but we have considered only selected PW as following 54 PW in Central Italy and all 31 PW in Northern Italy . The flexible selection of PW has been done considering day by day the sizes and concentrated flows in hours/timing , daily number of WP and

flocks .

We have observed in 7 years 2 or 3 PW for each year as following :

- in 5 years 3 PW/ 1 y, in Central Italy
- in 2 years 2 PW /1 y , in Central Italy
- in 2 years 3PW/1 y , in North Italy
- in 5 years 2 PW/1y , in North Italy

The PW represent the massive/extensive "take-off/migration starting" from origin or stop-over area of distinct populations or concentrated groups. It is clear that the intensity of migration's stimulus connected with biotic and abiotic factors is the basic factor to decide for starting in hour/few hours .

Many details about PW are at Fig.12-13-18-19 .

About "how many days are in one Peak or Wave ?" we have as following :

- Central Italy - "1-3 days" in 26 Peaks and "more than 3 days" in 14 Waves
- North Italy- "1-3 days" in 17 Peaks and "more than 3 days" in 10 Waves

About the volume of global transit during PW we have selected

Central Italy - Appennines'sites

- (A) " less than 1000 WP / 1 PW" : 22 PW
- (B) "between 1000-3000 WP /1 PW" : 26 PW
- (C) "more than 3000 WP/1 PW" : 6 PW

Central Italy - Elba island

- (A) : 1 PW
- (B) : 5 PW
- (C) " between 3000-10.000" : 10 PW
- (D) "more than 10.000" : 5 PW

North Italy - East

- (A) : 0 PW
- (B) : 3 PW
- (C) : 13 PW

North Italy -West

- (A) : 6 PW
- (B): 9 PW
- (C) : 6 PW

If we consider the flocks' size (more **than 100 WP/1 flock**) during PW we have :

North Italy on the "way in " (Monte di Malo) 184/2174 flocks = 8,46%

Central Italy on the "way out" (Elba) 417/1501 flocks = **27,78%**

Appennines' area of transit : 7-10 %

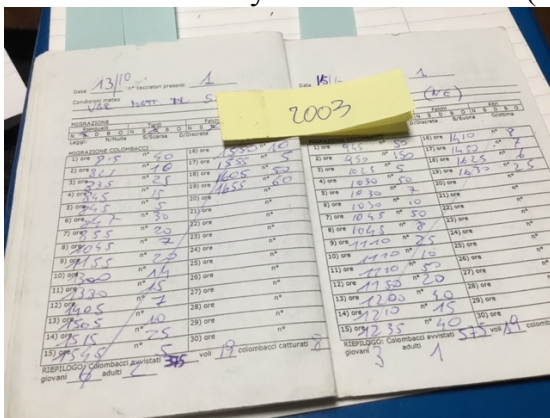
About "timing/sizes" dynamics , the data of the present research are fully aligned with the data of the research over 19 years monitoring (Londa) (1) as in Fig: 12

Remaining in the item "Results" we have a second package of "results data" as in Appendix "Meteo" , where we have collected (results) all the Links and details concerning Graphics and Maps (licenced by Weather History Archives and MeteoOffice UK Collections) concerning the abiotic factors to be confronted with the daily reports (2000-2006) of the migration's monitoring . We'll develop this item in "discussion" . Many of these relationships (abiotic factors) remain target of incoming research (

DISCUSSION

Interpreting the general and detailed pattern of seasonal dynamics of the WP autumn migration in Italy, is always quite difficult , depending on the methods to collect data by many different registrars and their continuity applying same method of counting recording the evolutive passage of WP over a territory extremely various for geographic and orographic characters as a bridge in Mediterranean sea between origin and stop-over area in East-Central Europe and Balkans and wintering area in North Africa and Iberian Peninsula .

The present retroactive research has choiced a selected matter to put together selected data recorded by very few selected expert Observers in a seasonal continuity for 7 documented (fig . 22) years.



The image shows a handwritten data recording page from a field notebook. At the top, there is a date '13/10' and a page number '151'. A yellow sticky note with the year '2003' is placed over the top part of the page. The page contains a grid of handwritten numbers, likely representing bird counts or observations over time. The numbers are organized in columns and rows, with some larger numbers like '1300' and '1655' visible. At the bottom of the page, there are some labels and a signature, including 'colombacci avventati' and 'colombacci catturati'.

Fig.22 - The hand-book's page to sign data recording of daily and hourly observations to document the migration in a specific site .

The registered amount of WP observed (2000-2006) is nearly half million of birds wich represents around 15-20% of total number of WP crossing the Italian peninsula in Autumn : indeed in Progetto Colombaccio (1998-2007) in ten years more than 130 Observers all over many Regions (N-E-W-S) of Italy had recorded in 10 years 4.834.000 WP with average /year 483.000 if multiplied for 7 years result is 3.380.000 /7y , compared with 443.000 observed in 7 years (2000-2006)of the present research , it is 15-20 % .

The large range of territories crossed by birds'migration over Italian Peninsula (North-South length around 1000 Km) is extended as a bridge in the Mediterranea sea , and it -so extensive- is a limit to obtain a total monitoring of the total mass of birds crossing Italy . However in the present research the focus over two main traditional corridors/routes perfectly monitored for 7 years could be considered emblematic of the global migration in Italy . Fig.5-7-14 .

Many results of the present retroactive research confirm the results and interpretations of the papers (1-2-3-4)

<http://www.scienceheresy.com/ornithologyheresy/index.html> - IJWR vol.2018 on-line

about the dynamics of the migration in Italy (2017-2018) , but some other items can be underlined .

It seems evident that **flexibility** of the WP for migration's choices of the various populations is a dominant character of this migrating species ,also depending on the origins of the populations wich remain -for Italy - a

problem to be better investigated (5) . Considering the eco-system's flexibility of WP we observe various forming of the flock's sizes and/or gathering of single groups of a single population or of different populations remaining yes/not faithful to the population's DNA independence and connected genetic migration's decision making . In ancient paper (1964) (7) on the basis of few ringed WP in Netherland it was adfirmed that changing of migratory routes from Scandinavia was improbable during many years , as a concept against the flexibility today well known also connected with wintering choices of different destinations' areas and wintering erratismis . In a recent paper (2017)(6) a research over Carpathians west mountains' pass is concluding that 40% of WP don't follow more the East-West Central Europe way northern Alps mountains to France and Rodano Valley , and prefer fly south-west to Hungary and through Mediterranean flyways as confirmed by the impressive growing of migrating WP mass in Italy during last years . Depending on different climatologic and meteorologic predominant conditions before and during migratory season over origins' and stop-over areas , the variability of the timing and intensity of migration is parallel to the flexibility of the choices for different dominant flyways over Italy . The evolution - and possible variability or stability - of Air Pressure (A.P.) fields and surface or altimetric corridors affect over these choices , as -on the other hand - the evolution of the status of food's availability or abundance (agriculture,woods'care) in the stop-over areas , and also the hunting pressure.

Some particular considerations can explain some results of our retroactive analysis (2000-2006) of so many data .

It is evident that every year we have 2-3 Peak Waves (PW) mostly in October but also sometimes in November : during PW we have some PW with less than 1000 WP (22/54 PW) , with between 1000-3000 WP (26/54 PW) ,with more than 3000 WP (6/54 PW) in Appennines'Central Italy ,but in the same route at the Tirrenia "terminal" Elba island we have respectively 1/21 PW,5/21 PW,10/21 PW with more than 3000,and 5/21 PW with more than 10.000 (***) . In the North (route from Monte di Malo-Veneto Region to Genoa , through long Padania Valley) we have respetively on the Eastern "door-way in" 0/16,3/16,13/16 (***) and on Western stations we have 6/21,9/21,6/21 . So we can interpretate that during the PW the WP mass is bigger at the "way in", then dispersed during transits , and biggest at the "way out " when the concentrated WP mass after stop-over (as for example in Tuscany after crossing Appenines) (fig.23) decides to start again for the final jump to West - SouthWest .

On these woods and forests (fig.23) in protected areas of Parks , WP can decide to perform a stop-over but also to remain wintering , sometimes also by winter erratismis depending on food availability in the Regional area.



Fig.23 : Woods and forests in protected areas of Tuscany Region on the areas between Appennines mountains and Tirrenian coast (Elba island)

The same mass-behaviour (mass biggest flocks for final migration to West) happens in November when after long,time stop-over in Tuscany , but also directly from Balkans , WP populations or parts of them decide to start .

The largest migrating WP mass recorded in Elba island in our analysis

Western "terminal" 2000 2001 2002 2003 2004 2005 2006

ELBA island

231.832	38.126	49.441	22.171	30.013	29.355	26.160	26.059
2345	344	355	285	307	372	351	331

Fig.24 : Numbers of WP and flocks recorded in Elba island in 7 years is depending on the confluence of other routes and movements directly from the North (Genova,Eastern cost of Liguria gulf,Appennines' transits more at North of our flyway here analysed) as in Fig. 7



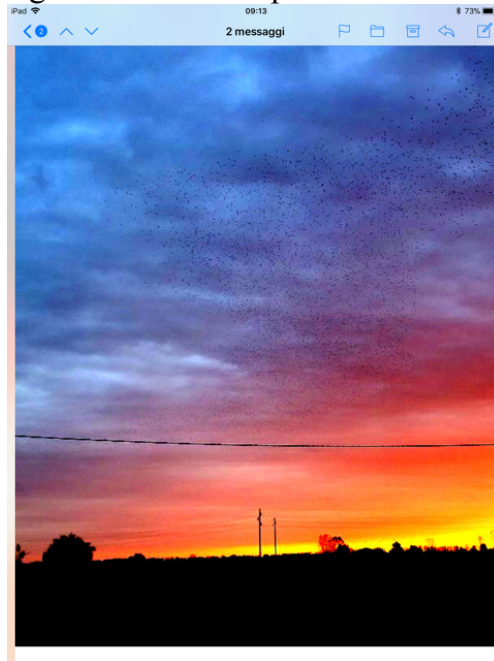
The migration crossing Elba has also an extended "timing" in November , also registering impressive Peak-Waves , likely as expression of receiving

dispersed groups or true populations stopping more days in stop-over (food availability- bad weather) during end of October . In Elba we have also to register 3/21 PW when in two days it was recorded a transit of more than 20.000 WP .

An other character inside the migration behaviour must be underlined : the size of flocks with more than 100 WP / 1 flock is 27,78 % in the present research . It seems expression of the result of prolonged stop-over and so on strengthening the "gregarism" sense as a better force to fly for the final migration , as more evident in our "Elba" data.

About the " timing" of the migration in the present research our data are alligned with the data collected in the analysis of Londa site (1) for 19 years , with some little variations in November .

The majority of flights/flocks (60-70 %) (fig.12) is observed before 11h a.m in the morning . The sunrise is an important factor determining take-off , and if the sky is clear the WP prefer to fly over the mountains' versants touched by the sun rays , probably to gain better metabolism effect of warming after colder temperatures in the night.



**Fig.25 - Massive take-off at sunrise in Mesola forest area in October.
(Original picture of G.Rossi in Mesola 25th October 2014)**

Sometimes during PW , flocks with size 100-300 WP are observed later than first hour after sunrise (15,43 % in the morning) but also during PW in the afternoon (11-8 %) : it could be hypotetic expression of more "reflective" decisions of take-off drawn up by the oldest experts WP as heads of the group.

Finally : what about concerns the relationships of WP migration in Italy and abiotic factors ? Controlling the results of the present analysis of many detailed data and items , we find full confirmation about the relationship of the stimulus to migrate and Air Pressure conditions as reported in precedent papers (3-4-2-1) .



Fig.26 - Geographic areas' A.P. (East and West of Appenines mountains) contolled for all the days object of the presnt research

If we take attention to explore the Graphics of the Autumn months in "Weather History" (licenced) we observe that the running of the daily Air Pressure line permits us to identify specific jumps of Air Pressure , and if we control the dates of Peaks and Waves we find quite regular coincidences of PW 12-24-48 h after the AP jumps.

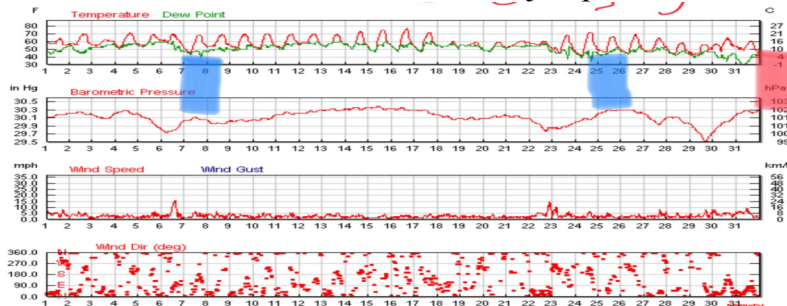


Fig: 27 - Typical Graphics of a month of October and corresponding three PW and jumps of Air Pressure . Temperature and winds enclosed.

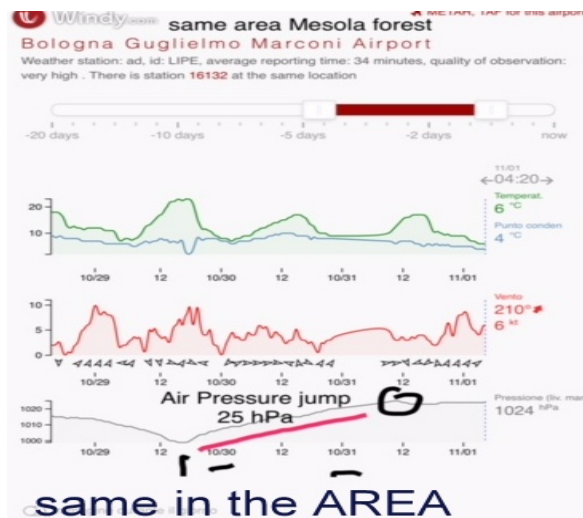


Fig.28 - The same can be checked on specific area as here , by Airport Meteo data where we have better graphics about temperature and winds

On the other hand the analysis of weather data and migration's flows must be performed over documented Maps , day by day , over the origin and transit areas . In the Appendix Meteo we have collected all the Links to check hundreds of maps (MeteoOffice UK) connected with the 7 years examined.

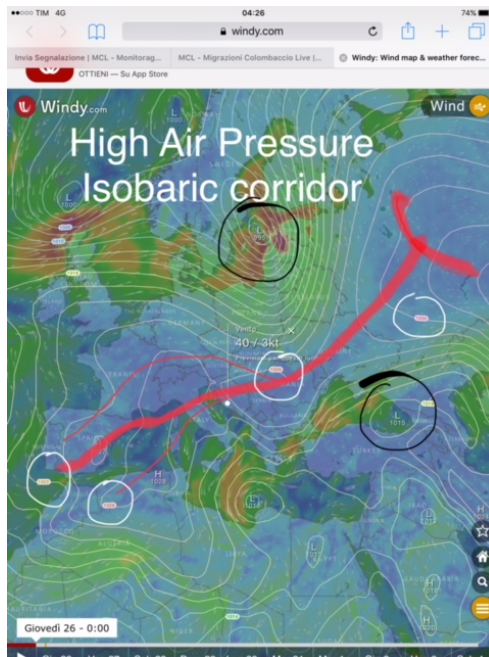


Fig.29- Isobaric corridor of High A.P., between two Low Pressure areas,crossing all the Europe , corresponding with massive WP migration at end of October

It is evident that the WP are able to forecast and identify isobaric high A.P.corridors - also in altimetry- to find best aerodynamics conditions to fly without turbolences and taking benefit to save energies and fat reserves (5-4-2-1) .

All the comparison of our data (PW) with the detailed meteo-data and maps and graphics as reported here in the bottom in Appendix Meteo , and other (3-4-2-1) confirm this assertion .

In present research we observe a jump of Air Pressure more than 10 hPa 12-24-48 h before PW take-off in origin and transit areas :

- Eastern North "way in" (Monte i Malo) 12/16 PW = 75 %
- Appennines' transit area (Romagna-Tuscany) 16/19 = 84 %
- Western "way out" (Elba island) 15/21 = 71 %

We must underline that also when the AP jump is less than 10 hPa , in 100 % we observe a A.P. values for the days of true migration - on the specific areas- all over 1015-1020 hPa . (check at Graphics in Appendix Meteo) .

Obviously many other factors biotic and abiotic must be considered .It is not suprising that all the connected data of the present local investigation over few (8) sites of observation , are perfectly similar to the data (biotic and abiotic factors) reported in precedent paper (3-2015) focused over Europe (France-Sweden-Italy : 47 PW in 15 years)and detailed graphics (copy/paste) considering all the statistics of single abiotic factors .

<https://plus.google.com/photos/103942035281038458760/albums/6086432829554328737> (copy/paste)

It seems a further proof that "**flexibility**" is the the main character of *Columba palumbus* Species - inside the complex connections of their ecology of senses and anatomo-physiological basical components - to

support the migration's behaviour , as confirmed by the detailed data of the present retroactive research.

Other consideration must be reported about the influence of the Moon phases , so much considered in the traditional hunters' culture .



Fig.30 - Moon phases

Remaining in the narrow limits of the Scientific Research, by our data (3) past and present , we can say that more than the A.P. jumps' data (statistical data) , as regard to abiotic factors we have found statistically significant (mass take-off in PW) in 62,51 % PW the surface of the Moon illuminated more than 40 % whether in waning or crescent moon's phases. More brightness of the sky during the nights could be also considered a factor favourable to nocturnal migration as recently documented in many occasions .

Further detailed analyses remain a crucial target of the present study to compare the flights' flows - as identified by the present review of data- with local winds , A.P. charts (difficult to collect locally) depending on the orographic-geographic status of the covered flyways during migrations 2000-2006 , trying to put documentation of the altimetric A.P. stable local corridors and ability of WP to choose them. This target remains also for the "work in progress" study by MCL research (4) of Club Italiano del Colombaccio .

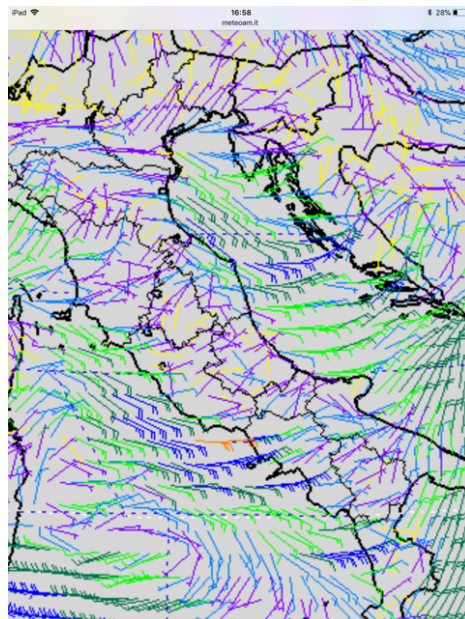


Fig.31 - Map of winds over Italy during an October's day

Inside these incoming research's targets we have planned a detailed analysis of biotic factors 2000-2006 as age / ratio connected with the number of shot WP which represent around 1% of the total observed .

CONCLUSION

A lot of documented data has been analyzed in the present retroactive research as reported in the Text,table,Appendix . We tried to develop a linear exposure of the focused analyses .

Some interpretations of particular factors of the migratory phenomenon seem quite new :

- uniform analysis along specific flyways and uniform long time collection of data ;

- seasonal timing and daily timing of the Migration connected with specific latit./longit. sites (way-in,transit,way-out)

- sizes of flocks during the transit (arrivals,transit,departures)

Other interpretations about abiotic factors (mostly Air Pressure relationships) remain confirmed (3-4-1).

Flexibility to organize and performing the autumn migration travel to Italy ,seems the main eco-sensitive character of the Species *Columba palumbus*

Further studies will be planned according to the aims of Club Italiano del Colombaccio and its Members .

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APPENDIX " APPENNINES"- " NORTHERN FLYWAY"

FLYWAY 1 - CENTRAL ITALY

	2000	2001	2002	2003	2004	2005	2006
M.PAOLO	3879	2992	4352	1420	1049	1996	4979
	<i>128</i>	<i>140</i>	<i>114</i>	<i>86</i>	<i>74</i>	<i>104</i>	<i>173</i>
TREDOZIO	3173	5934	1821	3888	3713	3403	7341
	<i>111</i>	<i>103</i>	<i>54</i>	<i>97</i>	<i>85</i>	<i>115</i>	<i>164</i>
EST	7052	8926	6173	5305	4762	5399	12320
49.937	239	243	168	184	159	219	337
1549							
LONDA	5284	5069	4300	3336	3480	4768	8712
	<i>167</i>	<i>177</i>	<i>168</i>	<i>138</i>	<i>168</i>	<i>158</i>	<i>229</i>
B.S.LORENZO	3039	3840	3893	2887	3086	2605	3230
	<i>111</i>	<i>201</i>	<i>160</i>	<i>112</i>	<i>151</i>	<i>119</i>	<i>156</i>
OVEST	8323	8909	8193	4223	6566	7373	11942
50.173	278	378	328	250	319	277	385
2369							
ELBA	38.126	49.441	22.171	30.013	29.355	26.160	26.059
island	344	355	285	307	372	351	331
231.832							
2345							

Numbers of Woodpigeons on EAST Appennine (M.Paolo-Tredozio) and WEST Appennine (Londa -B.go S.Lorenzo) 2000-2006

Numbers of flocks on EAST Appennine (M.Paolo-Tredozio) and WEST Appennine (Londa -B.go S.Lorenzo) 2000-2006

Numbers of Woodpigeons during Peaks/Waves on EAST and WEST Appennine in 7 years (2000-2006)

FLYWAY 2 - NORTHERN ITALY

Woodpigeons' number , flocks numbers, days of recording activities, size average on the site Monte di Malo (Veneto Region) EAST North Italy and WEST Italy (Genova - Albissola)

	2000	2001	2002	2003	2004	2005	2006
MONTE di							
MALO	7113	11.803	23.567	17.674	29.815	15.229	13.623
VENETO	159	25 585	22 511	28 515	27 541	37 781	34 589
							31

Tot. 7 years
118.851

3581

size av.32

days 208

CORONAT

A	4843	4357	7126	7626	13.321	6664	9988
Genova	252	32286	22254	25 254	35344	29215	24301 29

LIGURIA 1

Tot.7 years

53.925

1820

size av. 29

days 196

BRICCO

dei	5967	2316	2482	5304	3506	2819	3826
CORVI (SV)	166	30148	21 137	24211	21 63	28 140	21 148 21

LIGURIA 2

Tot.7 years

26.220

1013

size av. 26

days 166

Numbers of Woodpigeons recorded in EAST NORTH Italy (Monte di Malo) and in WEST Italy (GENOVA gulf Liguria - ALBISSOLA Bricco dei Corvi) 2000-2006

APPENDIX " METEO "

METEO DATA 1999-2006

All the EUROPE Air Pressure CHARTS , daily two, from 1999 to 2006 , month OCTOBER and other

from the following *FIRST* research Link *METEO OFFICE* (licensed Link)

copy/paste

<https://digital.nmla.metoffice.gov.uk/?>

[hh_cmis_query=DWS&cmis_parent_hierarchy=sdb%3AdigitalFile%7Ca11f56c5-666c-4905-8773-7d105cc06f2a&hh_cmis_view=search](https://digital.nmla.metoffice.gov.uk/?hh_cmis_query=DWS&cmis_parent_hierarchy=sdb%3AdigitalFile%7Ca11f56c5-666c-4905-8773-7d105cc06f2a&hh_cmis_view=search)

It is possible to explore all the *AIR PRESSURE CHARTS EUROPE* (pdf) [LINKS](#)

1999

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2000

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2004

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2005

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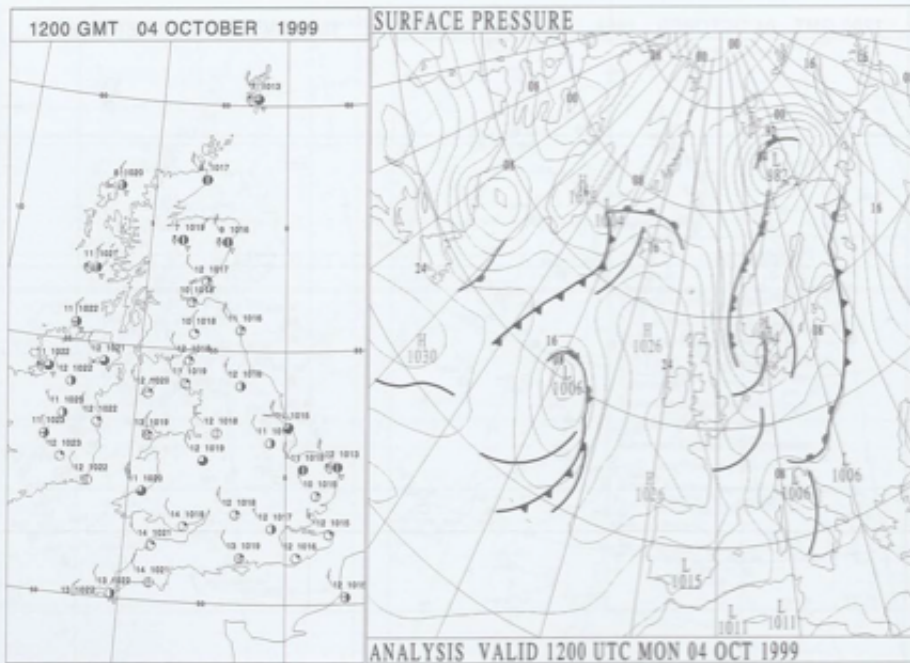
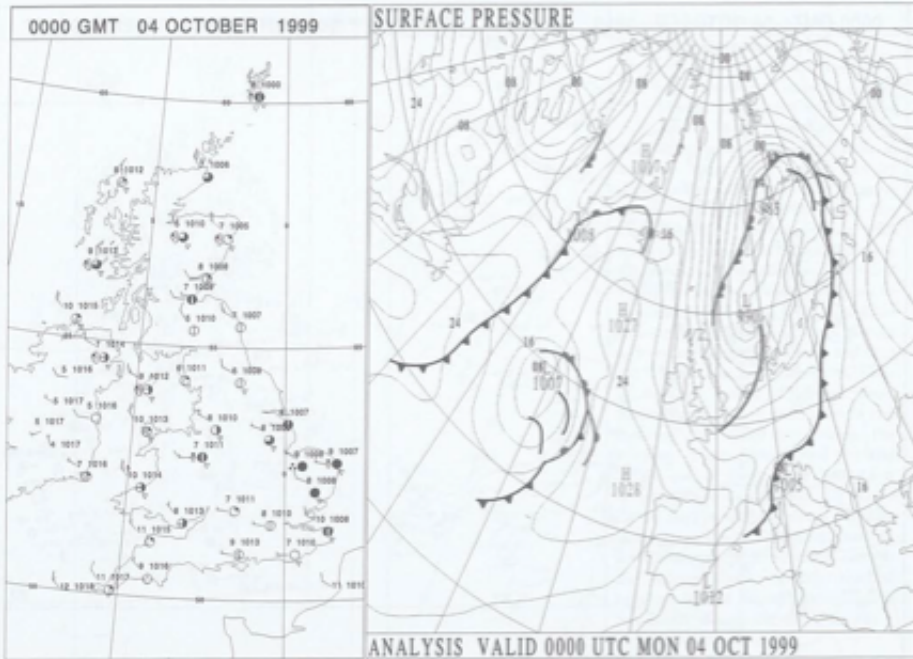
2006

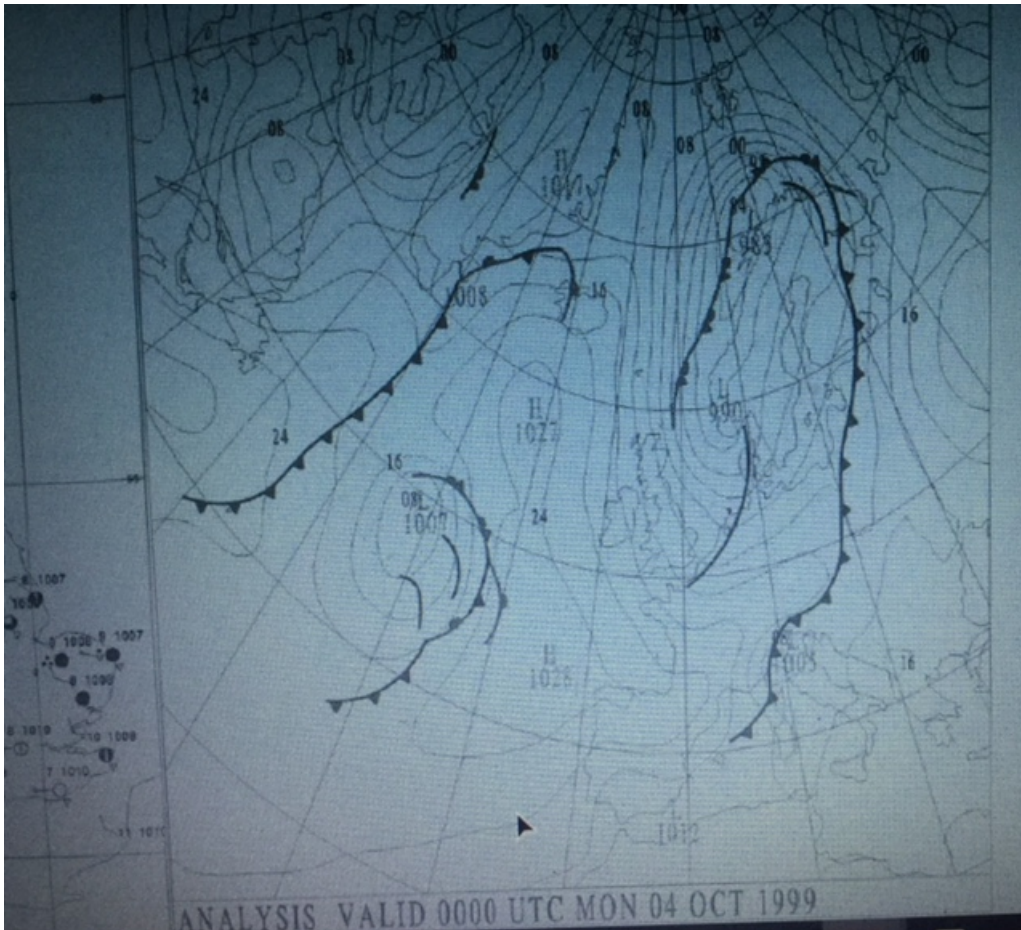
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CHECK also GRAPHICS

<https://plus.google.com/photos/103942035281038458760/albums/6086432829554328737> (copy/paste)

DAILY WEATHER SUMMARY





On the same years we can check the monthly (OCTOBER) **Graphics** (Temperature,Air Pressure,Winds force & direction) by Weather History (licensed) on the 3 areas (East-Ovest Appennine and Elba island) . November available.

<https://www.wunderground.com/history/index.html> SEARCH

Meteo Storia per LIPK - Ottobre 1999

Change the Weather History Date:

Ottobre

1999

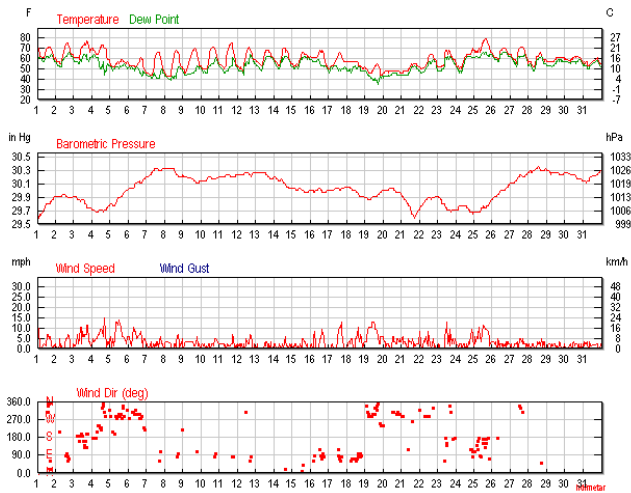
Visualizza

Month of Marzo, 1999 [Daily](#)[Weekly](#)[Monthly](#)[Custom](#)

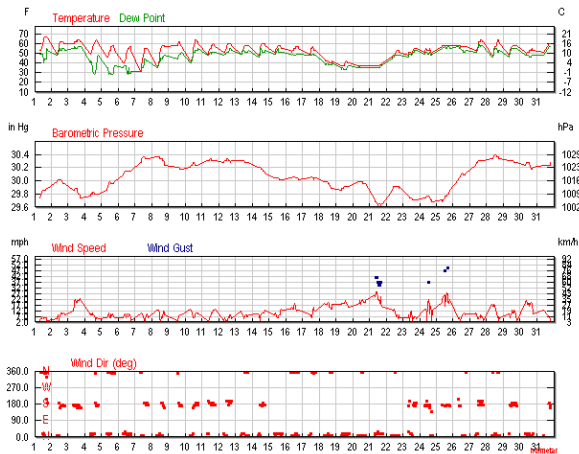


1999

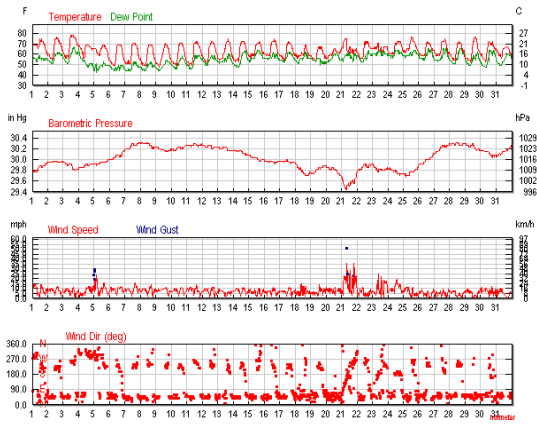
EAST



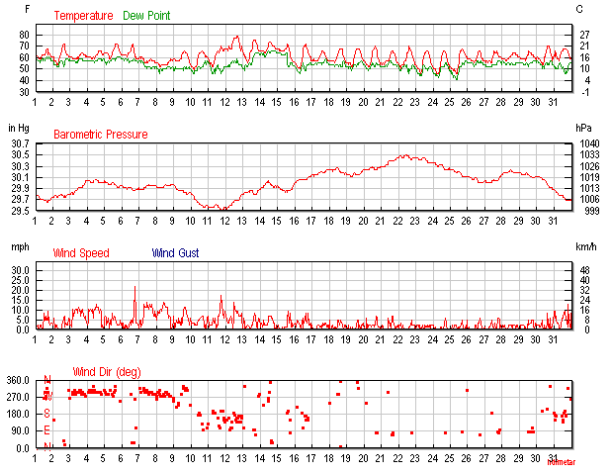
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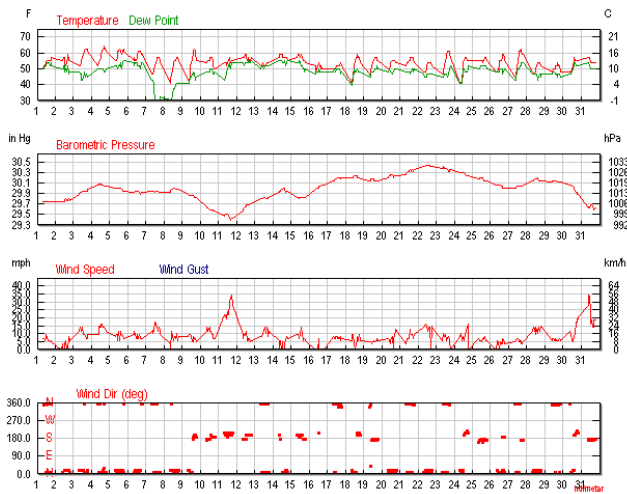
ELBA



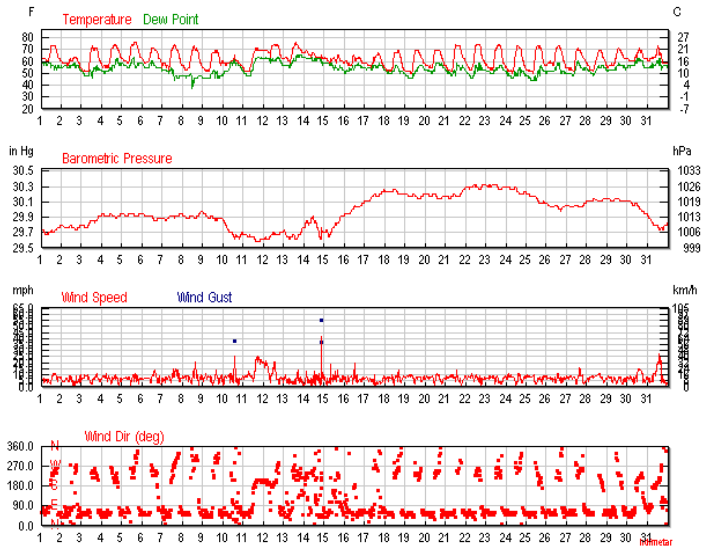
2000 EAST



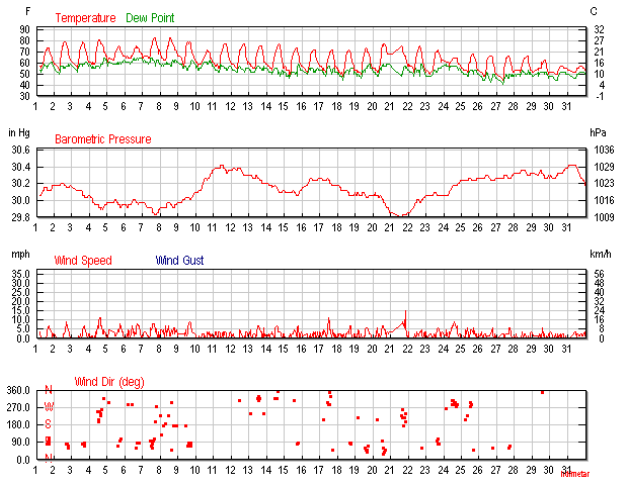
WEST



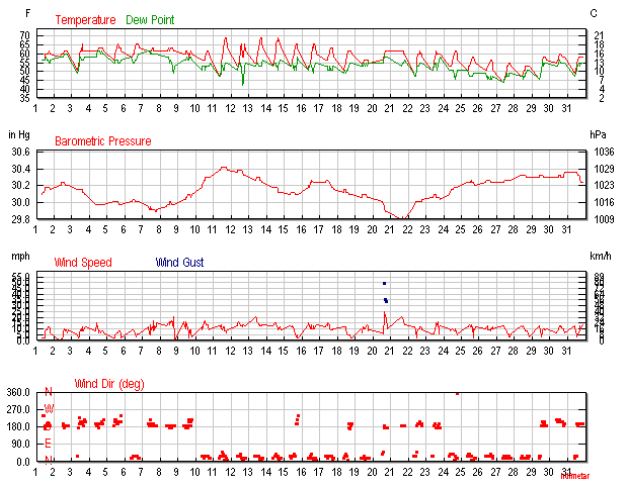
ELBA



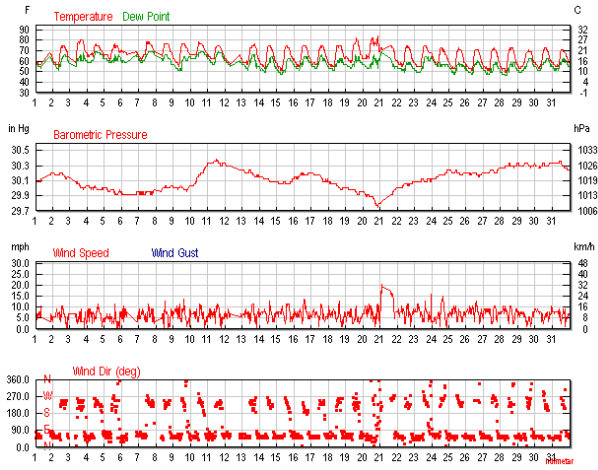
2001 East



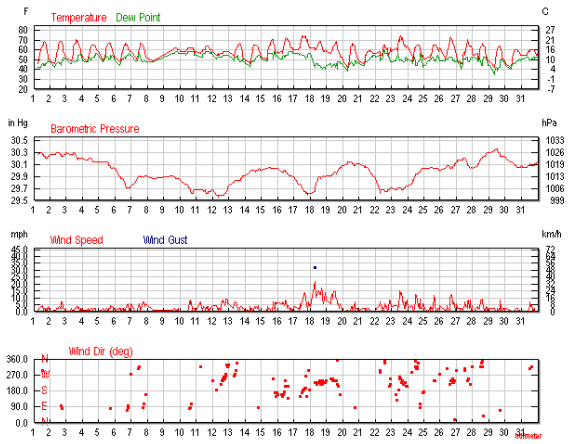
WEST



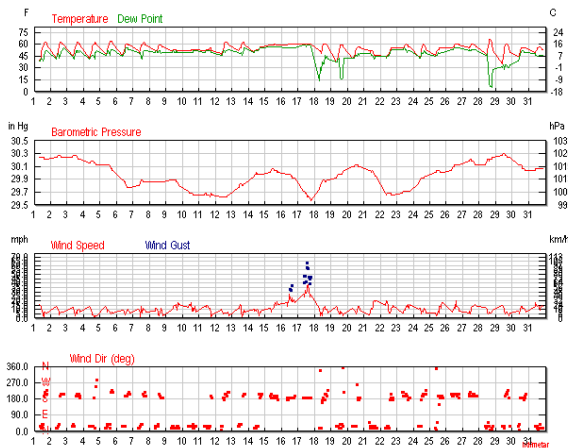
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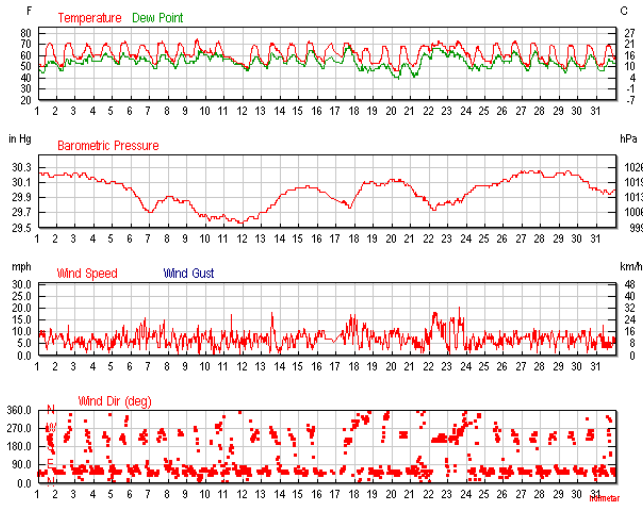
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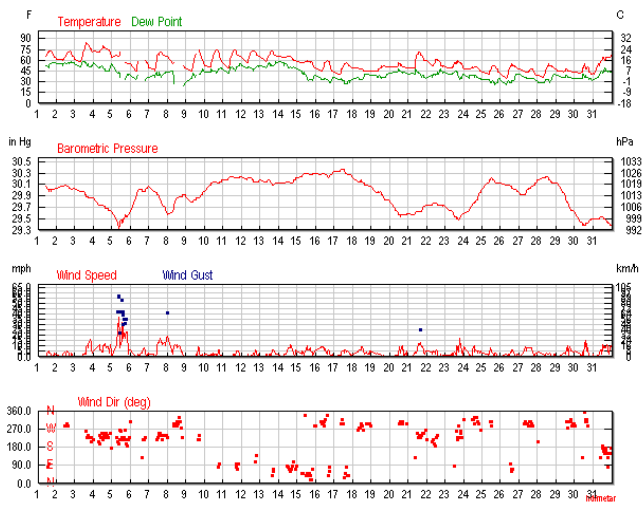
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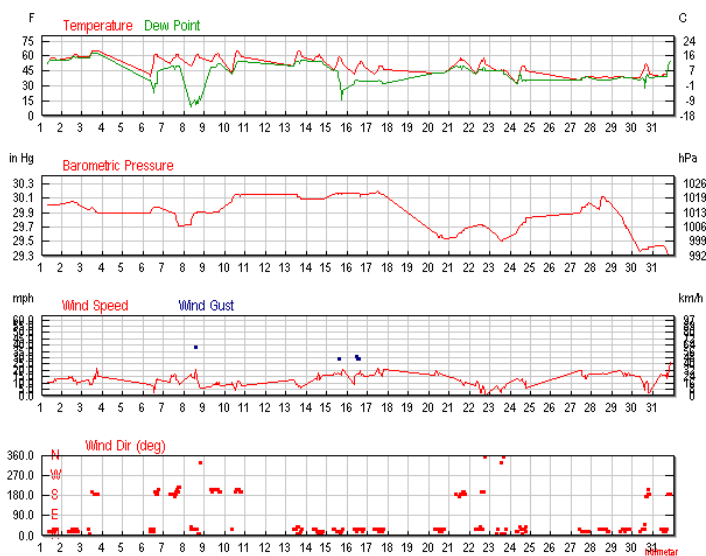
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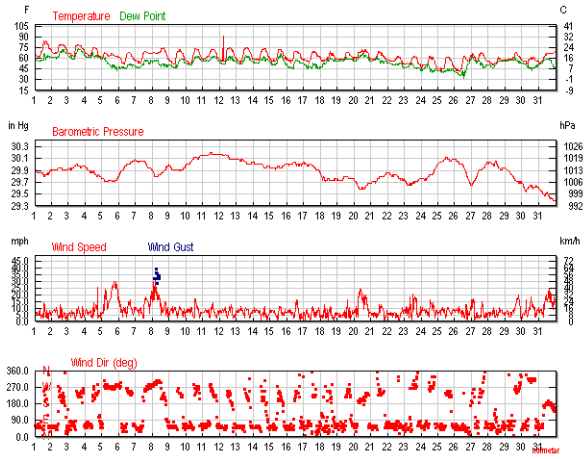
2003 East



WEST

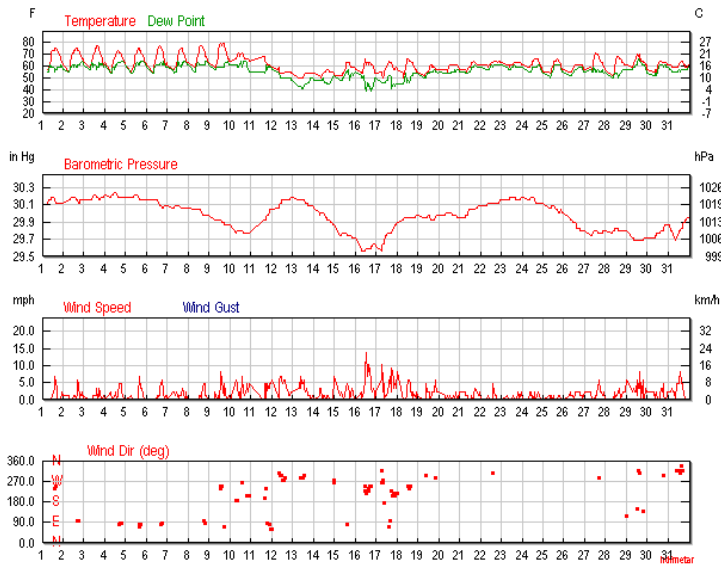


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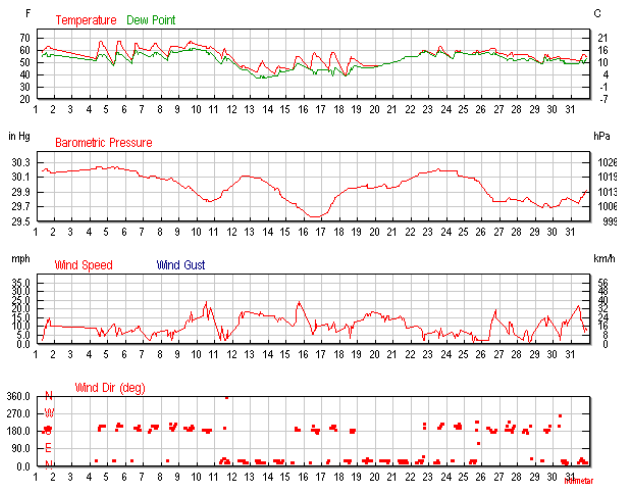


2004

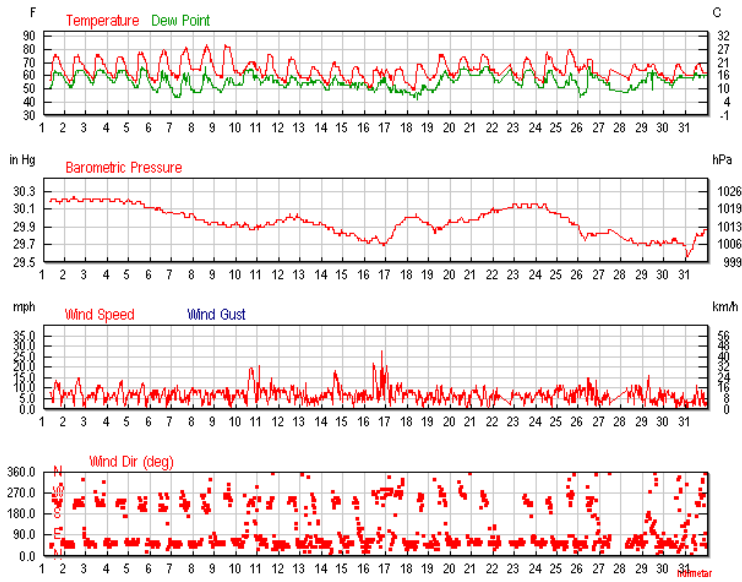
East



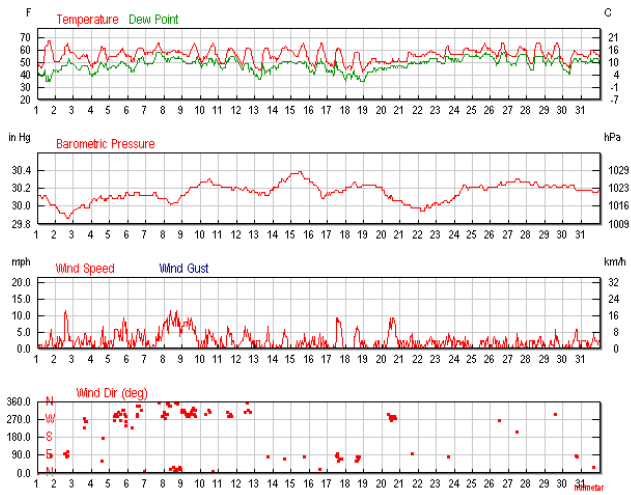
WEST



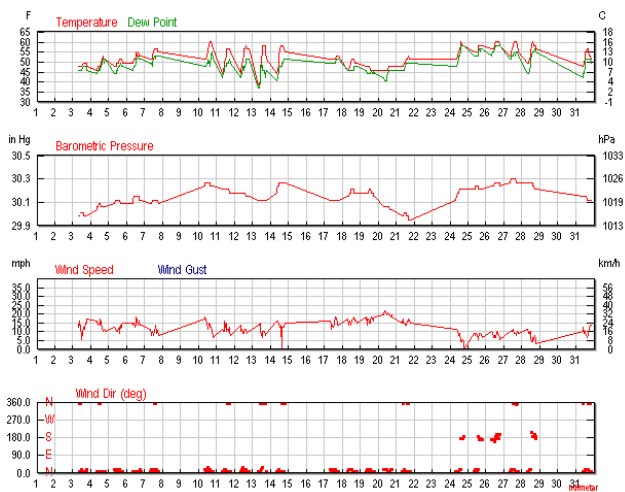
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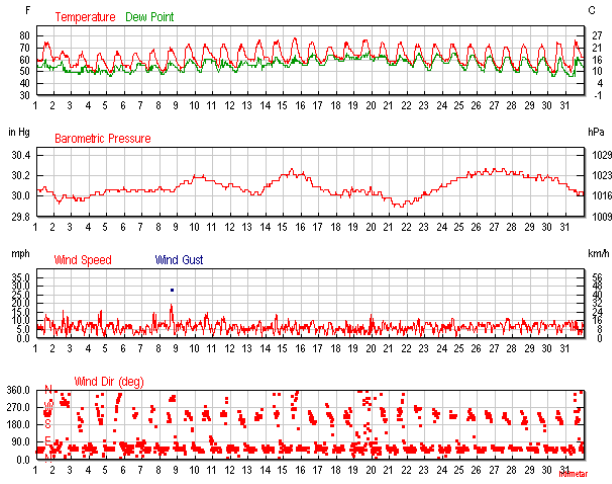
2005 EAST



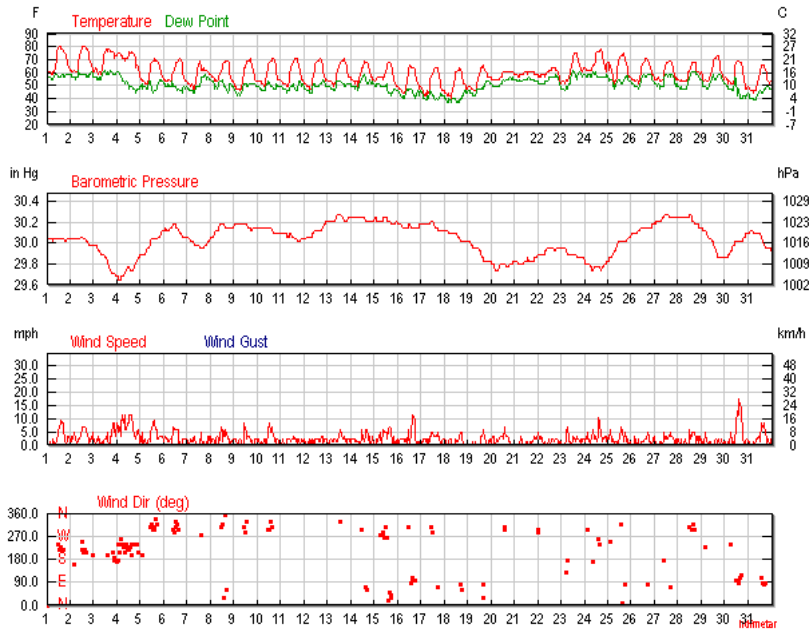
WEST



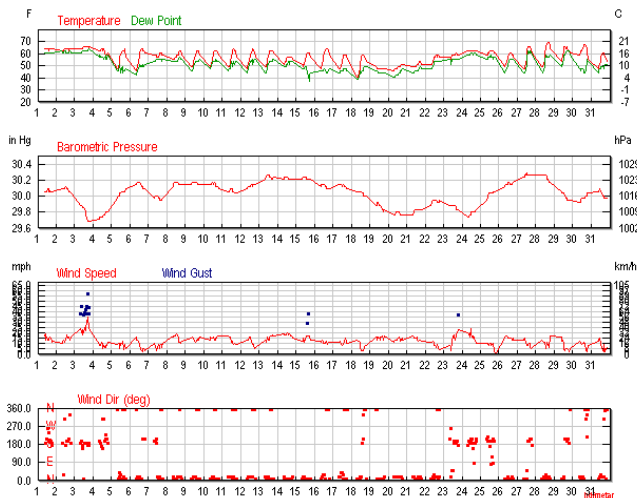
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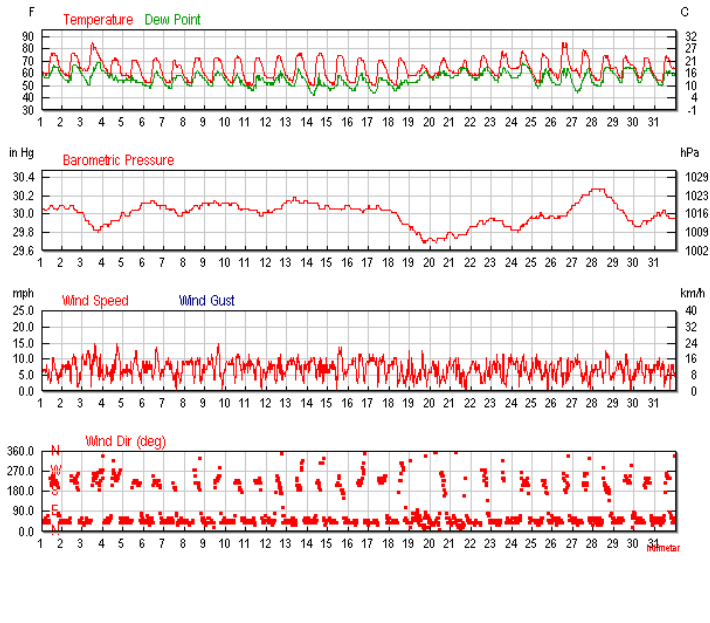
2006 EAST



WEST

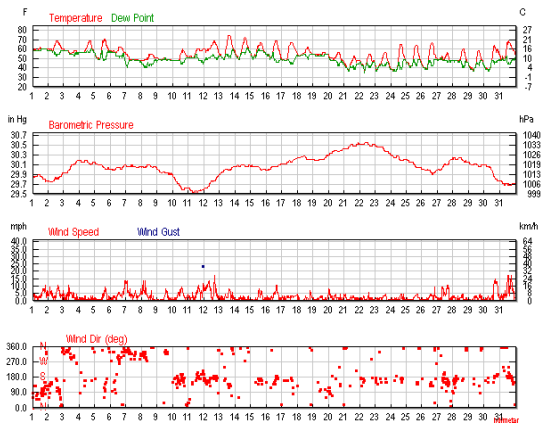


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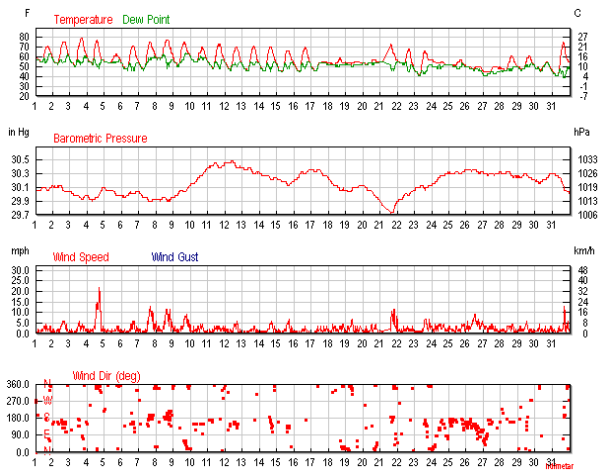


NORTH-EAST FLYWAY

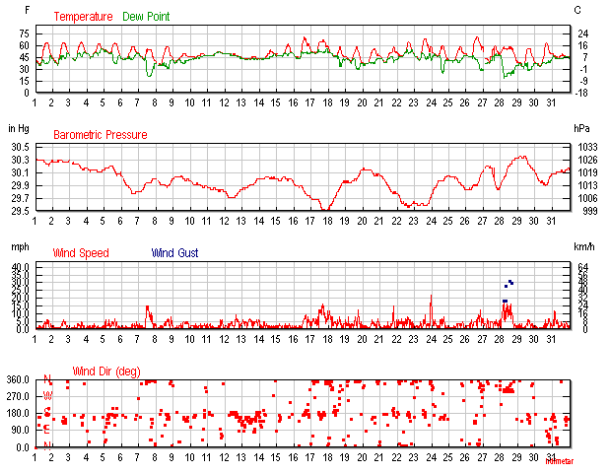
2000



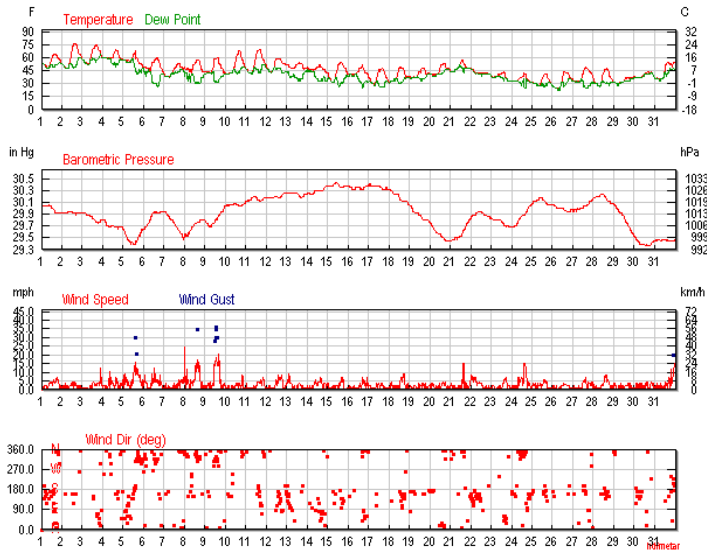
2001



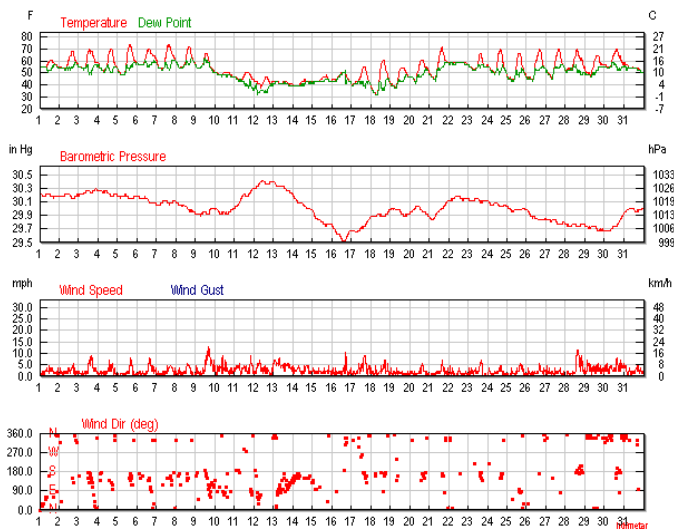
2002



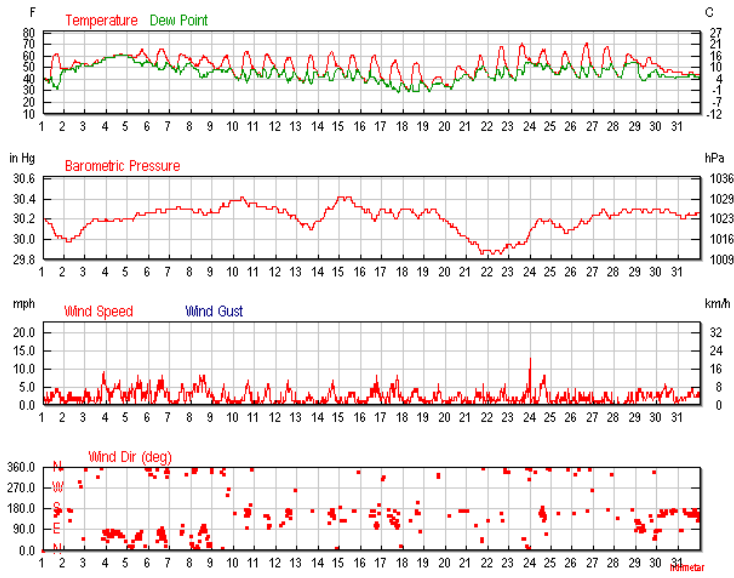
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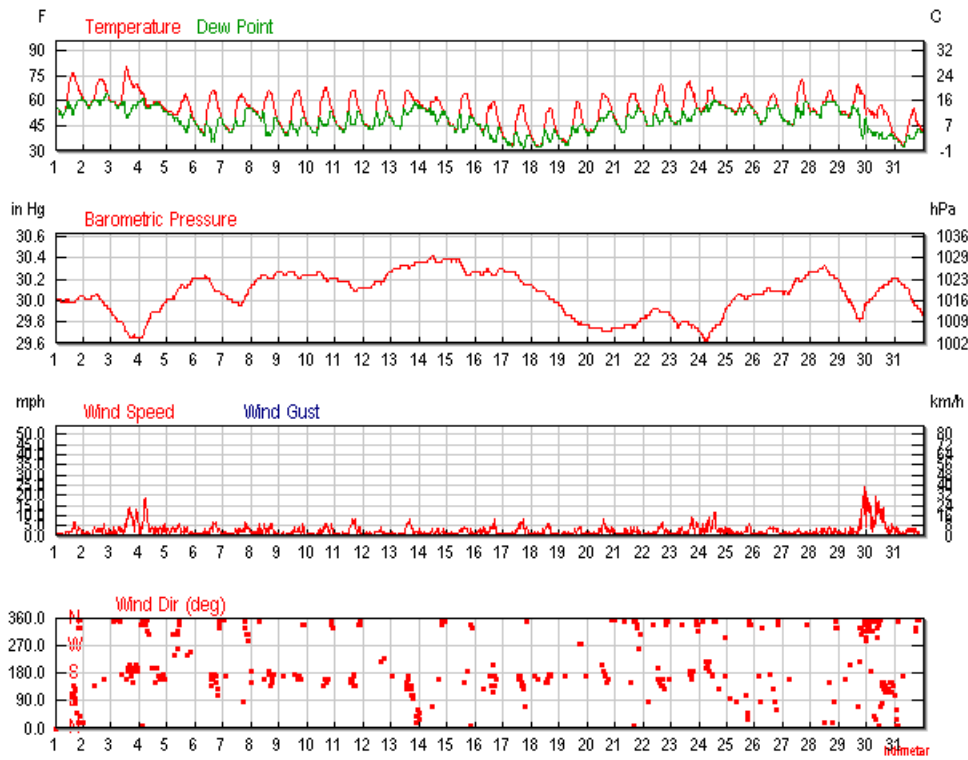
2004



2005

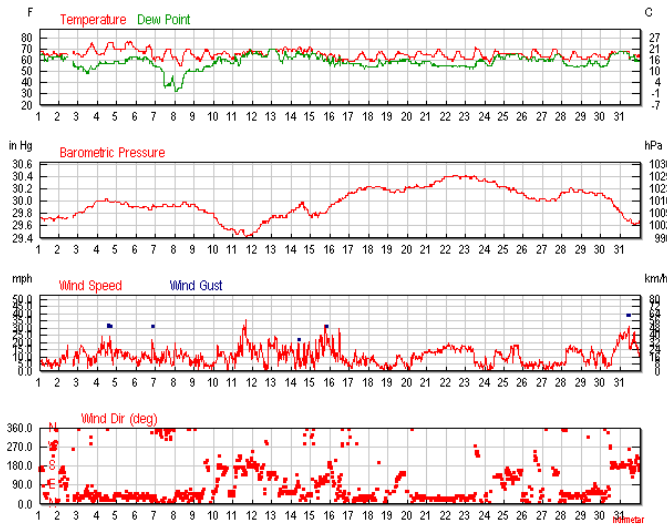


2006

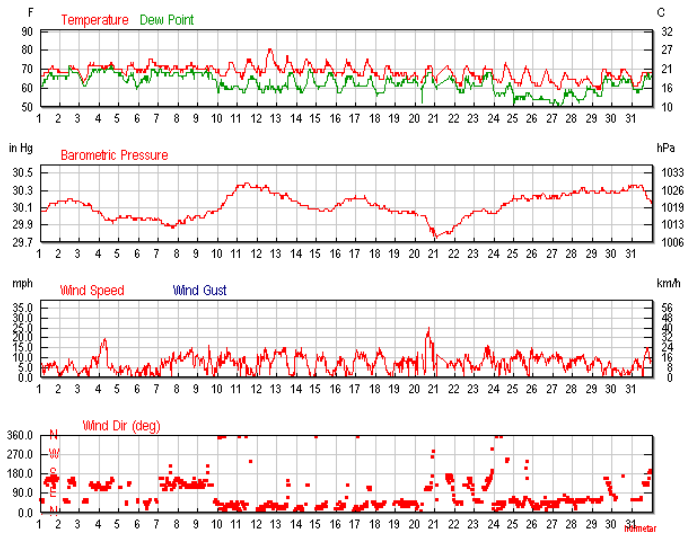


GENOVA

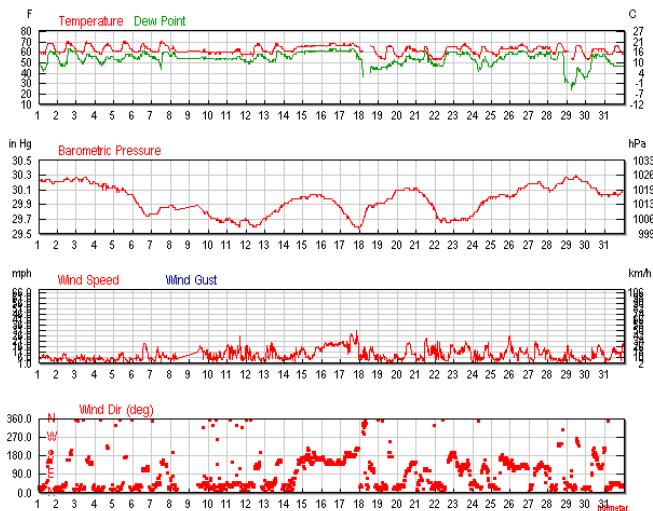
2000



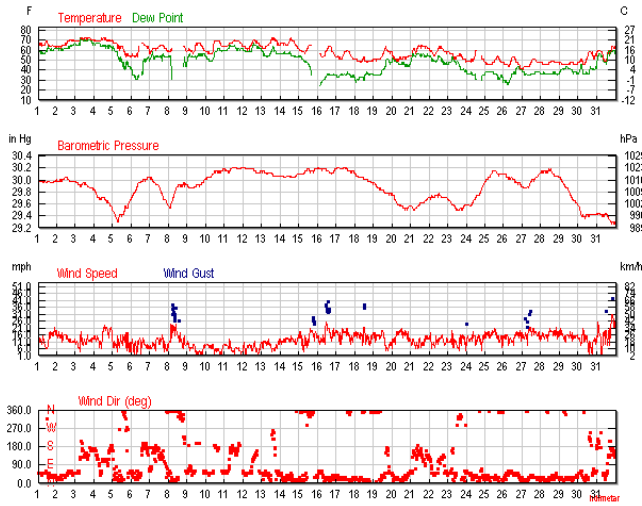
2001



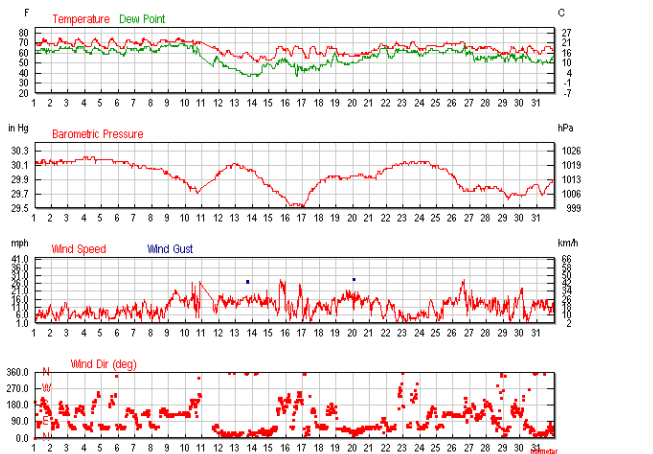
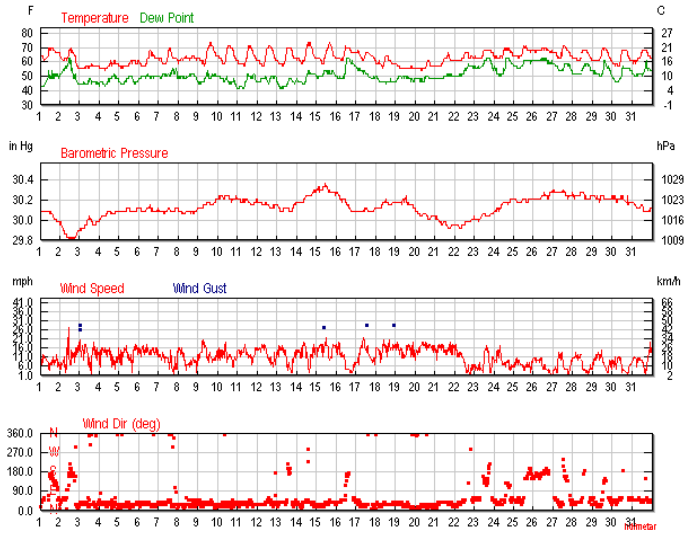
2002



2003



2004



2005

