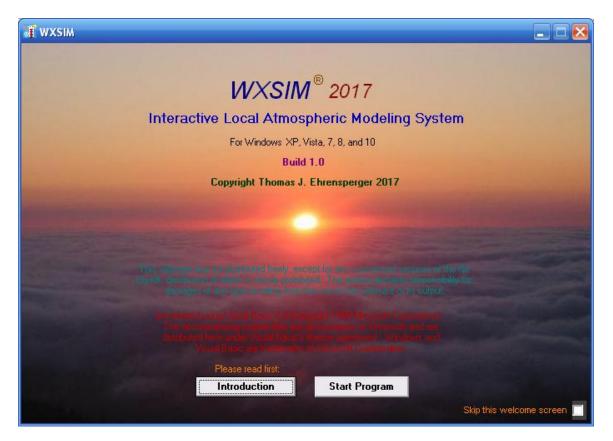
WXSIM Quick Start Guide

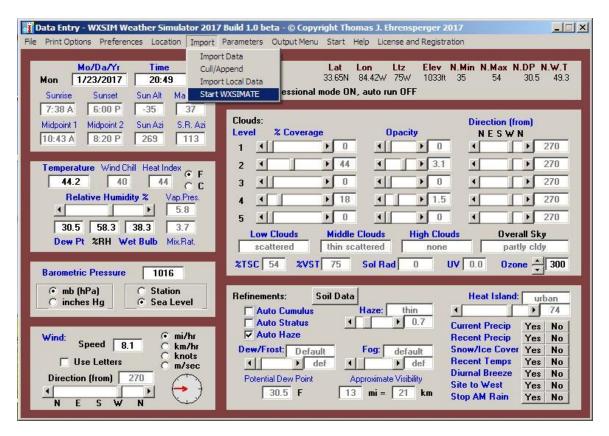
WXSIM is a large, complex, multi-purpose program that I've developed over the last 35 years. As a result, it has many features and options which are not essential for routine forecasting by most users. This can make it look intimidating to a beginner, but I've also tried very hard to make it user-friendly. A comprehensive manual (manual.doc) is provided in the WXSIM package, but there is a lot to learn and many users understandably want to get "up and running" as soon as possible. This illustrated guide is my attempt to address that need.

I'll first show in detail how to quickly get a manual forecast and then how you can automate the process and even upload the forecasts to a web site. I am assuming here that you have already registered and received your custom files. You should have Desktop icons for three related programs: WXSIM (the forecasting program), WXSIMATE (the data gathering program), and WRET (the forecast retrieval and analysis program). There are a couple of other auxiliary programs also in your wxsim folder: wxsimlite.exe and autolearn.exe, which can be used to improve your forecasts once you've archived a month or more of them. I very much recommend looking at these programs and their associated help files and reading about them in manual.doc

Before we begin, I want to make a very important point: you can get instant help on almost every item in the program simply by clicking on almost any **blue words** on any of the forms. This is true throughout WXSIM and WRET, but not in WXSIMATE, where help is provided via a single document by clicking on "Help" on the main menu bar.

OK, here's what you see when you first boot up WXSIM. I strongly suggest you click on and read the "Introduction".





After clicking "Start Program", you will see something like this:

The site should be your own customized one (here it's Atlanta). The date and time are simply those read from your computer when you started the program. The temperature and various humidity measures are simply the normal daily mean values for your site on that date (without regard to time of day). Pressure, wind, and cloud cover values shown are simply defaults, and no special "refinements" have been chosen. (All of these things can be manually altered for experimental or educational purposes, but for our purposes here, I'll assume you actually want to make a forecast). Your screen could look somewhat different. You might have other units set up, and a couple of the "Yes/No" refinements at lower right could show as red instead of blue if you've already been using them. This is not bad. It simply means they are already active (though you may want to click yes and check or re-set the data). Notice also that I've clicked on Import and am selecting Start WXSIMATE, which results in this appearing:

ᇌ WXSIMATE Version 6.2 - Internet and Home Weather Station Data Collec	ctor for WXSIM
Register Customize Schedule Help About	
Site Working directory Manual, for checked items: ATL+72219 C:\wxxsim	File to create: c:\wxsim\wdata.bt
Cull Append Cull Append	Include this c:\wxsim\readydat.txt
Internet Download Auto Cull Time stamp (UTC): latest	Import from Local Station Download Local station data directory (omit last slash)
Download Files and Append Year Month Day Hour Minute right after 2017 1 24 1 53	this month only (if http) c:\Program Files\Weatherlink\woodward
Auto scheduler ON Target URL:	Year Month Day Hour Time: latest or 2017 1 23 20
http://www.temis.nl/uvradiation/nrt/uvibare.php?lon=-84.428lat=33.65	Import Data Note: If the source file uses DST, then use it in WXSIM also.
Data Sources: (Use up/down controls on right or mouse wheel to scroll; click on choice in boxes to change selection)	Effective time 19:55
First instance only Extended Home Hr ++10 HETAR apply to be in the set of the se	Current Conditions Units: F, in.Hg, mi/h, in.
	Temperature 51.0 Precipitation rate 0.00
SYNOP http://weather.cod.edu/digatmos/syn/	Relative humidity 82 Duration (hours) 0.00
GFS model data C McMahon	Dew Point 45.7 Recent Data
RAOB http://www.rap.ucar.edu/weather/upper/Current.rawins	Pressure 29.66 24 hour max T 54.9
Last mult of C 6 @ 12 C 07 C 127 Site: V 1 V 2 V 3	Wind speed 10.5 24 hour min T 46.9
Assume 1 hr lag	Wind gust 26.6 4 day mean T 58.4
✓ NAM FOUS http://tgftp.nws.noaa.gov/data/raw/fo/ Site: ✓ 1 □ 2 □ 3 FOUS and MOS are for North America only	Wind direction 315 24 hour precip 0.00
MOS http://www.nws.noaa.gov/mdl/forecast/text/	* Estimated clouds 82 Ended (hrs) ago 24.00
GFS V NAM Omit half during cull to shorten file	* Main cloud level 1 7 day precip 0.01
✓ Ozone in Dobson Units (Copyright [©] KNMI/ESA; http://www.temis.nl/)	* Estimated haze 0.3 30 day precip 0.20
Download progress (updates with each file downloaded):	* Valid only with solar radiation sensor in daytime Soil
Files appended	<i></i>

WXSIMATE is the included (and almost essential) data gathering program for WXSIM. Note that the left side of the form pertains to gathering data from the internet, while the right side is for importing data from your home weather station. Note: 'Download Files' and 'Import Data' have already been clicked in this view.

The site shown here is Atlanta (ATL+72219), but you should see your own METAR + synoptic code in that box if you've registered. There are many choices of settings, with the ones shown appropriate for many users in the U.S. and some in southern Canada or northern Mexico. METAR is airport surface data, updated every hour or half hour, plus some special reports. The buoy data, from oceans and large lakes, is updated hourly.

SYNOP surface data may be appropriate for many parts of the world, but you should remember that this data is updated at best every 3 hours (usually 6). If you're also importing local data, it should be at about the same hour as the synoptic data. RAOB is upper air data from balloon soundings, usually released about an hour after the launches at 00Z and 12Z. The FOUS and MOS model products do not exist outside the U.S., so non-North American users should leave those unchecked. These update every 6 or hours.

The Local Station import has settings for where WXSIMATE should look for your data. If you are using Weather Display, the files it's looking for are log files, such as 12017lg.txt (for January, 2007) and 12017vantagelog.txt (if you have a solar radiation sensor). Enter the directory (but not the file name) in the box. A similar situation exists if you have Davis WeatherLink, from which WXSIMATE can read the .wlk files (as is the case in the screen shot above), Virtual Weather Station (dbase.csv files), or Cumulus (like Jan17log.txt).

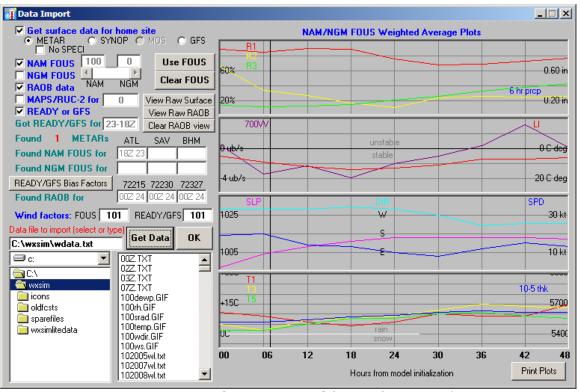
Many important settings must be made or verified, under Customize. Generally, these will be set appropriately by default (or during customization), but unit choices vary a lot from user to user, so be sure to have a look. Your settings, like almost everything in WXSIM and WXSIMATE, are saved on exit.

To get the internet data, click Download Files. If you want to import home weather station data, click the green "Import Data" on the right. The internet data will be saved with the name in the "File to Create" box; remember this name so you can import that same data into WXSIM shortly. The home station data is recorded as localdat.txt and localcal.txt, for ingest into WXSIM. Note: Cloud cover is derived from solar radiation data. If you don't have a solar radiation sensor, or if it is at night, you will likely see the cloud cover listed as 100%, which should be ignored. Locallog.txt preserves a readable record of this data. Note that some of it has various averaging or adjusting routines applied, so you may see slightly different numbers from what's on your station at the moment. Click "Help" at the top for more information.

After you've gotten your data, exit WXSIMATE using the Close button, to return you to this:

Data Entry - WXSIM Weather Simulator 2017	Build 1.0 beta - © Copyright Thor	nas J. Ehrensperger 201	
File Print Options Preferences Location Import	Parameters Output Menu Start H	elp License and Registrati	on
Mo/Da/Yr Time Cull/A Mon 1/23/2017 20:49 Impor		84.42W 75W 1033ft	I.Min N.Max N.DP N.W.T 35 54 30.5 49.3
7:38 A 6:00 P -35 37 Midpoint 1 Midpoint 2 Sun Azi S.R. Azi 10:43 A 8:20 P 269 113	Clouds: Level & Coverage 1 1 0	Opacity	Direction (from) NESWN 1 270
Temperature Wind Chill Heat Index 44.2 40 44 C		< ▶ 3.1< ▶ 0	 ▲ 270 ▲ 270 ▲ 270
Relative Humidity % Vap.Pres. 1 5.8 30.5 58.3 38.3 3.7 Dew Pt %RH Wet Bulb Mix.Rat.	4 • 18 5 • 0 Low Clouds Middle 1 scattered thin sca		
Barometric Pressure 1016 • mb (hPa) • inches Hg • Station • Sea Level	%TSC 54 %VST 75 Refinements: Soil Data Auto Cumulus Auto Stratus	Haze: thin	V 0.0 0zone ★ 300 Heat Island: urban
Wind: Speed 8.1 Use Letters Direction (from) 270 N E S W N	Auto Haze	Fog: default S ▶ def F proximate Visibility S	Current Precip Yes No Becent Precip Yes No inow/Ice Cover Yes No Becent Temps Yes No Jurnal Breeze Yes No ite to West Yes No itop AM Rain Yes No

It's now time to import the data gathered by WXSIMATE, so I've started to select Import Data. Doing so brings up the Data Import form:



Here, I've already selected the file to import (C:\wxsim\wdata.txt). That choice is saved on exit, so if you always use the same file name in WXSIM and WXSIMATE, you won't have to bother with this step. Note the choices of data to import. The checks shown are best for most U.S. users, but elsewhere you'll probably want to un-check NAM FOUS (actually NGM has been discontinued). If METAR data is sparse in your area, you might try SYNOP as the surface data type, though that's rare. GFS is an option is no surface stations of any type are nearby.

I've also already clicked "Get Data". A RAOB data form appears:

📑 Impo	orted U	lpper Ai	ir (RAOE) Data											
				RAOB	SOUN	IDING B	OR DAY	(= 24		TIME	= 00Z				
Synopt	ic Co	de :													
		7	2215				7	2230				7	2327		
P(mb)	H (m)	T (C)	DP(C)	WD W	S(kt)	H (m)	T (C)	DP(C)	WD	WS(k	t) H(m)	T (C)	DP(C)	WD	WS(kt)
300			-61.5		-			-59.7					-58.3		
400			-64.3		-			-40.1					-67.3		
500	5560		-39.1			5610	-15.1	-23.1	315	85	5550	-17.5	-43.5	315	66
700	2944	-0.3	-16.3	330 4	9	2972	2.0	-47.0	330	48	2940	-4.3	-12.3		
850	1367	7.8	-2.2	335 4	8	1403	6.6	1.6	330	30	1387	4.0	4.0	340	23
925	670	10.0	4.0	300 3	0	706	10.0	4.0	295	19	703	2.0	1.0	305	22
1000	16	14.9	9.9	0	0	50	15.1	10.1	0	0	65	7.3	2.3	0	0
986	244	13.4	6.4	315 1	.2	178	14.3	7.3	290	12	180	6.5	3.3	305	10
	-		erage T(C)		-										
											ness =		meters		
	300		-37.6										meters		
	400		-22.4								rapolati		surfa	ce:	
	500		-16.4								.7C = 5				
	700	2939	-1.0					rom 85				4.4F			
	850	1363	7.6		336			rom 70			.1C = 7	7.1F		H	elp
	925	667	9.3		301	31		ndex =							
	1000	15	14.2	9.2	90	0	TT	Index	= 3	8.2		Set Upp	or L find	·····	
	965	315	12.1	5.5	318	12	Sho KO	ted In walter Index den In	Ind =	lex = 4.4		Direc			<u>о</u> к

I then clicked "Set Upper Winds" on that and then click OK. In general, a few different message boxes can appear during data import. Mostly you just click OK, though if you get messages saying data is old, you should probably investigate. A message about difficulty reconciling total cloud cover and relative humidity sometimes appears. This is merely a caution that the cloud cover forecast may be less accurate than otherwise, but again, just click OK. If you get a message about visibility being the maximum reported, you may want to alter haze manually on the main data entry form when you return to it.

Note that some information is displayed, too, such as the fact that 1 METAR report for the home site was found and that FOUS, READY/GFS, and RAOB data was found, for the times indicated. Note that the large majority of users will have gotten the GFS data from the McMahon or Bohler options in WXSIMATE, rather than manually copying and pasting data from the NOAA READY site.

If you imported FOUS, various colored lines will appear on the graphs at right. These are simply information, which a careful forecaster may want to look at. The NAM/NGM scroll bar is generally irrelevant and defaults to 100% NAM, now that NGM is not available. To actually use the FOUS data, click "Use FOUS" and the following will appear:

FOUS Usage Setup		<u>_ </u>
Explanation Effect	t (% of maximum)	1/2 life
Upper Air Temperatures	▶ 45	16.4
Boundary Layer Temperatures 🔳	▶ 20	69.3
Sea Level Pressure	▶ 60	6.9
Advection prompt for wind direction	changes > 30	degrees
 Clouds Clearing trend levels 1 and 4 	<u>S</u> et All Effects to	o Zero
Level 2 relative humidity	<u>R</u> estore Default	Values
 Precipitation Showers (specifically from FOUS) Wind (speed and direction) 	<u>о</u> к	

For an explanation, click on "Explanation"! ^(C) When you're done, just click OK, and you should be back to the data entry form:

	7 Build 1.0 beta - © Copyright Thomas J. Ehrensperger 2017
File Print Options Preferences Location Import	Parameters Output Menu Start Help License and Registration
Mo/Da/Yr Time DST Mon 1/23/2017 00522 □ Sunrise Sunset Sun Alt Max S.Al. 7:38 A 6:00 P -23 37	Site Name Lat Lon Ltz Elev N.Min N.Max N.DP N.W.T Atlanta 33.65N 84.42W 75W 1033ft 35 54 30.5 49.3 Status: professional mode ON, auto run OFF Image: status of the s
Midpoint 1 Midpoint 2 Sun Azi S.R. Azi 10:43 A 8:20 P 262 113	Clouds: Direction (from) Level % Coverage Opacity N E S W N 1 1 38 3.5 4 321
Temperature Wind Chill Heat Index ● F 52 47 52 C C Relative Humidity % Vap.Pres. I <t< th=""><th>2 4 75 4 3.6 4 270 3 4 6 4 6 270 4 4 6 4 6 70 5 4 6 6 6 70 Low Clouds Middle Clouds High Clouds Overall Sky broken none none m.cldy-cldy</th></t<>	2 4 75 4 3.6 4 270 3 4 6 4 6 270 4 4 6 4 6 70 5 4 6 6 6 70 Low Clouds Middle Clouds High Clouds Overall Sky broken none none m.cldy-cldy
Barometric Pressure 1003.4 Image: matrix m	%TSC 84 %VST 44 Sol Rad 0 UV 0.0 Ozone 300 Refinements: Soil Data Heat Island: urban Auto Cumulus Haze: VERIFY 1 74 Auto Stratus 1 1 Cumont Purpoin Yes
Wind: Speed 17.3 Use Letters Direction (from) 310 N E S W N	Auto Stratus Image: Constraint of the straint of t

Look carefully to see what's changed from before. Since METAR was found, this information has been used to populate the form with current conditions at that site. Notice that the time was changed, to reflect the actual time of the observation. However, the Date was NOT changed. WXSIM doesn't bother to read the date of the METAR observation. You simply should ensure that the date is correct (note that under Preferences you can switch between MM/DD/YYYY and DD/MM/YYYY formats). The date should be valid for your location, NOT necessarily the time stamp on the METAR reports, as that will use "Zulu" (Greenwich Mean Time). For example, it could be 0052Z of January 24, but in the United States it would still be the evening of January 23, so the 23 should stay. Also, check DST if you want the output to use Daylight Savings Time. This check also refers to the input time, EXCEPT that it is ignored if the time is in the above format ("Z", or Greenwich Mean Time). If that is the case, just leave it as is.

The values shown are all subject to your scrutiny, and you should feel free to change them if you have reason to. A good example is Haze (note the red "VERIFY" message). Just look out the window and enter what seems right. You can change clouds as well. You might also have reason to use some of the Refinements at lower right.

If you have a home weather station from which you wish to import data, you can do so as illustrated below:

	7 Build 1.0 beta - © Copyright Thomas J. Ehrensperger 2017
	Parameters Output Menu Start Help License and Registration
Mo/Da/Yr Time Cull/A Mon 1/23/2017 0052Z Import	rt Data Append Lat Lon Ltz Elev N.Min N.Max N.DP N.W.T 33.65N 84.42W 75W 1033ft 35 54 30.5 49.3 t WXSIMATE essional mode ON, auto run OFF
7:38 A 6:00 P -23 37 Midpoint 1 Midpoint 2 Sun Azi S.R. Azi 10:43 A 8:20 P 262 113	Clouds: Direction (from) Level % Coverage Opacity N E S W N 1 1 38 1 3.5 1 321
Temperature Wind Chill Heat Index 52 47 52 C Relative Humidity % Vap.Pres. 4 > 10.2 45 76.9 48.3 6.6 Dew Pt %RH Wet Bulb Mix.Rat.	2 4 75 4 3.6 4 270 3 4 4 6 4 70 4 70 4 4 6 4 70 4 70 5 4 4 6 4 70 6 4 70 4 70 6 4 70 4 70 7 4 4 70 4 7 4 4 70 4 7 4 4 70 7 4 4 70 10 4 70 10 4 70 10 4 70 10 4 70 10 4 70 10 4 70 10 4 70 10 4 70 10 4 70 10 4 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10 10
Barometric Pressure 1003.4 [©] mb (hPa) [©] inches Hg [©] Sea Level	%TSC 84 %VST 44 Sol Rad 0 UV 0.0 Ozone 300 Refinements: Soil Data Heat Island: urban Auto Cumulus Haze: VERIFY 1 74 Auto Stratus 1 1 Cumust Busein No
Wind: Speed 17.3 Use Letters Use Letters Direction (from) 310 N E S W N	Auto Stratus Image: Current Precip Yes No Image: Current Precip Yes No No Image: Current Precip Yes No Image: Current P

After you select Import Local Data, the following will appear:

Local Station Data Import	X
-	nt WXSIM to import and use imported automatically)
Current Data	Recent Data (for refinements)
🔽 Temperature	Recent Precipitation
🔽 Relative Humidity	Recent Temperatures
Pressure	
Wind Speed	Data for Calibration Run
Wind Direction	✓ Wind Speed
Cloud Cover	Cloud Cover
Precipitation	Estimated Haze
🔽 Estimated Haze	Help
Minimum sun altitude for current clouds or haze 10	<u>C</u> ancel

It is your decision what to import. Recall that any METAR or SYNOP data already imported is actually for your assigned "Home" METAR or SYNOP site, not for your house. You should import only data which you feel will be more reliable than the official data already on the data

entry form. The most commonly omitted boxes will be cloud cover and estimated haze (four, total), which can be determined by the system only is you have a solar sensor, and then, only in the daytime. The nighttime problem is taken care of by the 'Minimum sun altitude for current clouds or haze' setting. (For Calibration Run purposes, data from earlier daylight hours may be used, but this is not something the user normally interacts with).

Date, time, and whatever you have checked will be imported and used to overwrite the existing data. You will actually see a couple more forms, about Recent Temperature and Recent Precipitation data after clicking OK. Read the help on those, and when you're satisfied with them (which is almost always, probably); click OK, until you're back to:

	7 Build 1.0 beta - © Copyright Thomas J. Ehrensperger 2017
File Print Options Preferences Location Import	Parameters Output Menu Start Help License and Registration
Mo/Da/YrTimeDSTMon1/23/201719:55ISunriseSunsetSun AltMax S.Al.	Full Start Site Name Test for Midpoints Min N.Max N.DP N.W.T Atlanta Calibration Run 35 54 30.5 49.3 Status: professional m Auto Run and Other Settings
7:38 A 6:00 P -24 37 Midpoint 1 Midpoint 2 Sun Azi S.R. Azi 10:43 A 8:20 P 262 113	Clouds: Direction (from) Level % Coverage Opacity N E S W N 1 1 38 3.5 4 326
Temperature Wind Chill Heat Index F 51.0 47 51 C C Relative Humidity % Vap.Pres. 10.4 10.4 45.7 82.0 48.2 6.8 Dew Pt %RH Wet Bulb Mix.Rat.	2 4 75 4 3.6 4 270 3 4 75 4 270 4 270 4 4 70 4 270 5 4 70 4 270 Low Clouds Middle Clouds High Clouds Overall Sky broken none m.cldy-cldy
Barometric Pressure 1005 [©] mb (hPa) [©] inches Hg [©] Station [©] Sea Level	2TSC 84 2VST 44 Sol Rad 0 UV 0.0 Ozone 300 Refinements: Soil Data Heat Island: urban Auto Cumulus Haze: VERIFY 4 74
Wind: Speed 10.5 Use Letters Direction (from) 315 N E S W N	Auto Stratus ▲ ▲ 1 Current Precip Yes No ✓ Auto Haze Fog: default Generation Snow/Ice Cover Yes No ✓ Image: Dew/Frost: Default Fog: default Fog: Default Yes No ✓ Image: Dew/Frost: Default Fog: default Potential Dew Point Approximate Visibility Diurnal Breeze Yes No ✓ 45.7 F 10 mi = 16 km Stop AM Rain Yes No

In this example, you can see that values in many of the boxes have changed somewhat, because the readings imported from my weather station are a bit different from those at KATL, a few miles away. The time ended up being 5 minutes before the hour instead of 8 minutes before. That's because of the way I have the archive interval set to 10 minutes in the WeatherLink software I use, so that's the middle of 10 minutes of averaged data leading up to the 'top of the hour'. If I have reason to, I could manually alter any of this data, but at this point, I trust it.

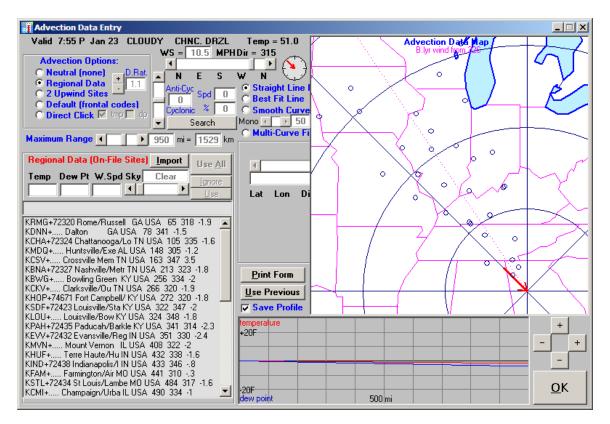
Note that I'm about to click on Full Start, to get started on this forecast! A very brief "calibration run" occurs, followed immediately by the Upper Level Data Verification form:

Upper	Level D	ata Verif	ication -	Valid 7	:55 P Ja	n 23 (Usi	ing Geopo	tential Heights)
Level	Pres	HtAGL	HLASL	Тетр	D.Pt	R.Hum	W.Dir	300 > > .300
Surf	968	0	315	10.6	7.6	82	315	
Mn BL	953	128	443	10.0	5.2	72	319	
Upr BL	944	213	528	9.8	4.3	69	323	dew pt
1	910	511	826	8.1	3.1	70	326	raob
2	838	1192	1507	5.9	-2.3	55	270	lift from L2
3	693	2725	3040	-0.7			270	iit from suf
4	500	5255	5570	-15.9			270	
5	300	8928	9242	-39.3			270	500 5090 m AGL
				atory' RA	OB Lev	els:		
1000	1000	-273	42	12.5				
925	925	575	890	8.7				
850	850	1071	1386	6.4				
700	700	2642	2957	-0.3				700
500	500	5255	5570	-15.9			270	
300	300	8928	9242	-39.3			270	
	CLOU	DY CH	INC. DRZ	ZL				850
SC% =	82	√LT% =	40	Haze =	1.0	Vis = 10) mi	925 Ici
	SLP =	1005	1000)-850 thk	- 1244	Lie C	ond Lyl	1000 surface
	JLI -	1005		700 thk :				Temp Adjust MIX Level 1, 2 Dew Points
Heights	:in: 1	emps in:)-500 thk				Save Adj 1-Click Auto Fix at Auto Clds View Previous
O Feet		🔿 deg F		B based th				Use Prev 1 🗸 3.1 Fix 🗌 St
Mete		⊙ deg C		6 based th			525	Multi Layer FOUS 2 -2.3 Fix Cu Reset Previous
le mea	eis	.⊜ uey∟) Y based ti) Y based t		Freez	ing Level	
B.lyr der	n from n	orm:+2 A					2553	Single Layer Lvl Adj %S.Cov Opacity (none yet)
D.Iyi uch	p nom n	01111.12.4					2868	I +1.4 38 3.5
					bility Inc			4 3 12 75 26
	CL S	с вк о	V	d Index =		Showalte		4 3 +19 0 00 View RAUB text
Est.Max			₂ Kino	dex =		KO Index		↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓
L V. MUA			🗧 🛛 Tota	Totals =	= 36.9	Boyden =	92.0	 ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓ ↓

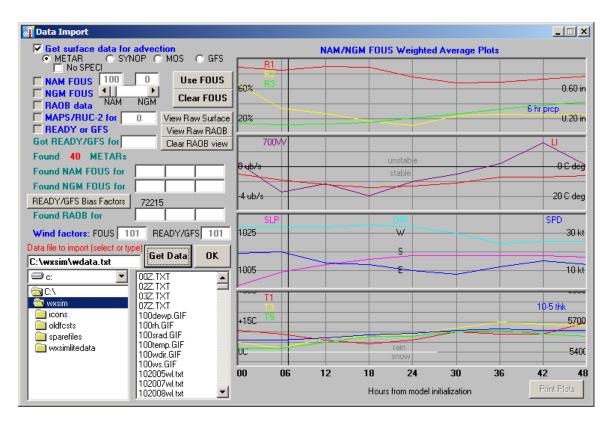
This has loads of useful information and lots of options. Most of the time, though, you'll just click "1 Click", which causes the red (temperature) and blue (dew point) soundings to pop from WXSIM's initial guess to a slightly adjusted version of the RAOB data imported earlier. Click OK here and you'll see the Advection Data Entry form:

Advection Data Entry	
Valid 7:55 P Jan 23 CLOUDY CHNC. DRZL	Temp = 51.0 DP = 45.7 Using deg F and miles
Advection Options:	Dir = 315
	Two Upwind Sites
	Distance Temp Dew Pt
O 2 Unwind Sites	C Straight Line Fit C Best Fit Line Site 1: 300 51.0 45.7
O Default (frontal codes)	
C Direct Click M mp. dp. 0,000000	C Smooth Curve Fit Site 2: 600 51.0 45.7 Mono + [→ 50
	C Multi-Curve Fit
Maximum Range 950 mi = 1529 km	
Regional Data (On-File Sites) Import Use All	Frontal Codes
Temp Dew Pt W.Spd Sky Clear	Text
gnore	
Use	Lat Lon Dist Temp DP Gradients (F/100 mi): Temp Dew Pt.
	Print Form
	Use Previous
	Save Profile
	temperature +
	* · · · · · · · · · · · · · · · · · · ·
	<u><u>O</u>K</u>
[]	dew poiņt 500 mi statu

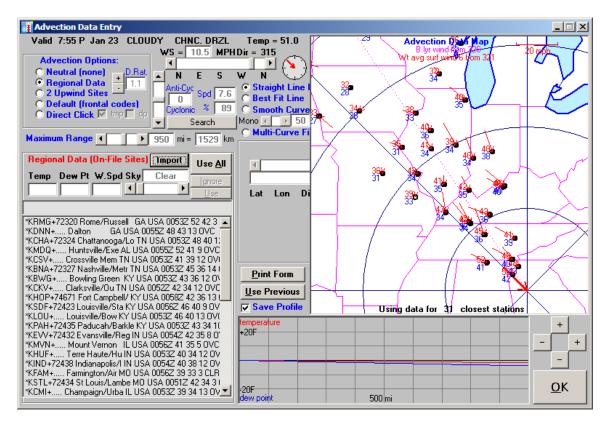
You have lots of choices here, but if METAR or SYNOP data was downloaded by WXSIMATE, the best choice is usually Regional Data Advection. Here's what appears after you select that:



The map shows potential advection sites within 22 degrees of the upwind direction (actually the upwind direction for the mean boundary layer wind, which was estimated using surface wind direction and latitude). WXSIM doesn't know yet which, if any stations you want to use. You could select stations one at a time and manually enter their data, but normally, you'll click Import, which brings back a familiar form:

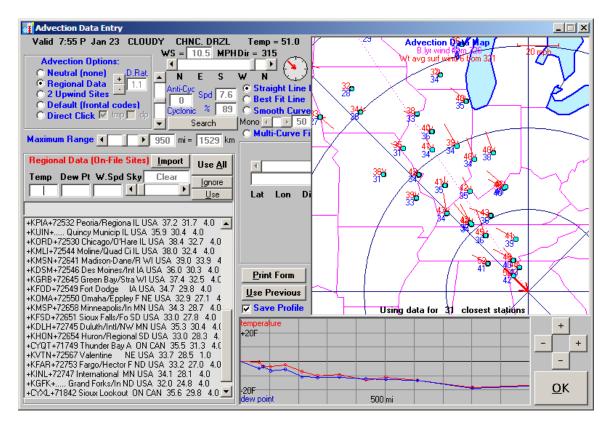


One thing is different from before, though. Only surface data is enabled, because only it is relevant to advection in WXSIM. METAR was once again my data of choice. I already clicked Get Data, and 40 upwind sites were found. After clicking OK, we're back to the Advection form:



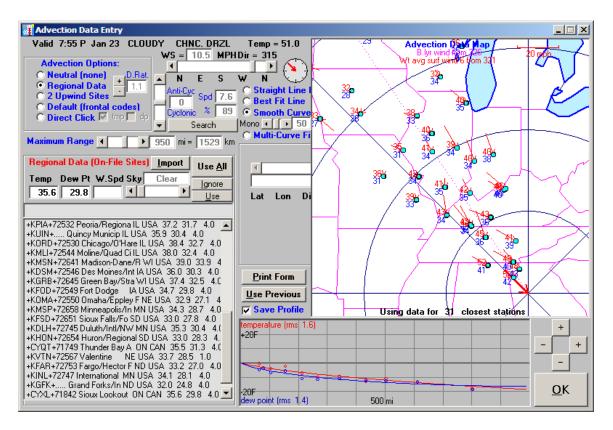
Now the site list and map are populated with data (temperature, dew point, and wind), but I haven't yet declared that I'm using any of it. Notice that the dotted upwind direction doesn't quite match the wind arrows perfectly, and the % fit is only 89 (which is actually higher than you'll usually see). Also, the dotted line is oriented along azimuth 326 instead of the surface wind direction of 315. This is deliberate, to represent the 'boundary layer' average wind direction, instead of right at (10 meters above) the surface.

WXSIM needs to know which of these sites you want to actually use. You could click on individual sites in the list and then click 'Use', but usually it's best to just use all of them, so click 'Use All'. When you do this, the asterisked sites will get "+" signs in from of them instead. Also, you should now see plots of red and blue jagged lines on the advection profile graph at lower right, showing how much temperature and dew point (after adjustments for things such as elevation) at different upwind distances differ from yours. You should see something like this:



If, for some reason, you don't trust one of the sites, you can click on it and click 'Ignore'. You can also restrict the maximum distance of used sites by adjusting the 'Maximum Range' scroll bar before clicking 'Use All'. It's usually best to keep it at least several hundred miles. The quadrangle of '+' and '-' signs are for changing the temperature and distance (upwind) scales, to suit your preferences.

The somewhat jagged nature of the curves is probably due to all kinds of 'random' factors, and the actual upwind profiles should be smoother. Towards this end, there are the Best Fit Line, Smooth Curve (with 'Monotone' slider), and Multi-Curve fit options. Click on the blue text for more information on these, but my choice here will be Smooth Curve, with 50% Monotone. (You generally want to minimize the "rms" ("root mean square") errors in the advection profile, but some wisdom and experience can help here, too. You should really look at the upwind profile and try to understand what it's telling you). Here's what selecting those generates:

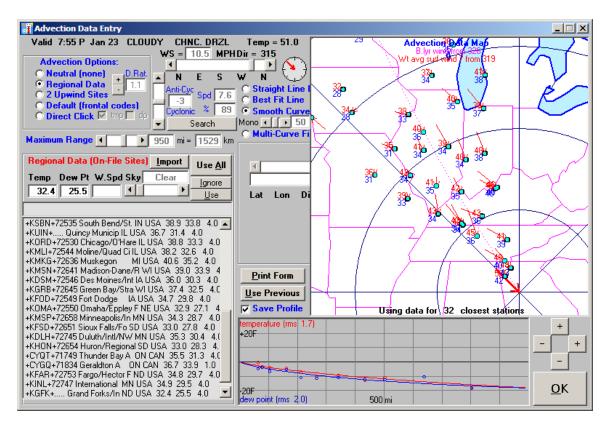


These upwind temperature and dew point profiles are very plausible for this cold air advection scenario, soon after the passage of a cold front. However, there is still a likelihood that the wind field is either cyclonic (counter-clockwise in the northern hemisphere) or anticyclonic – in other words, curved. In this example, that's not very prominent, but in most cases, we'd like a better fit than the default 0 curvature (straight line).

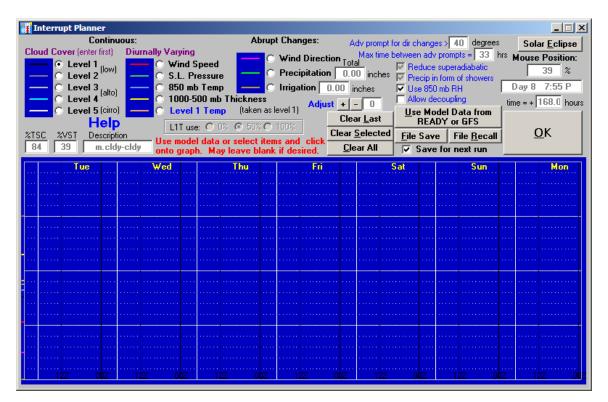
Getting the best fit can be a slightly tedious process, and not always all that advantageous. It can be quite important at times, though, so here's what you do. First, try clicking on the Cyclonic/Anticyclonic scroll bar and observe the changes in the dotted line on the map and on the percent fit. Make an initial attempt to maximize that percentage, and THEN go back to the Neutral Advection Option and THEN click on Regional Data again. There's more: you need to re-import the data and observe the new selection of stations, AND the new percentage fit, which may have changed slightly. Also, each time you import advection data and return to the Advection form, you'll need to click 'Use All'.

HOWEVER, you will be glad to learn, though, that WXSIM itself can do all of this decision making and button clicking for you! Just click Search and you can then watch the program do all that work on its own. Here, it decided on a curvature of only -3 (slightly cyclonic) which did not improve the already good fit noticeably. Often, though, you'll get a much better fit after clicking the Search button, indicated by higher 'Spd' and '%' values.

This next view shows the results of clicking Search:

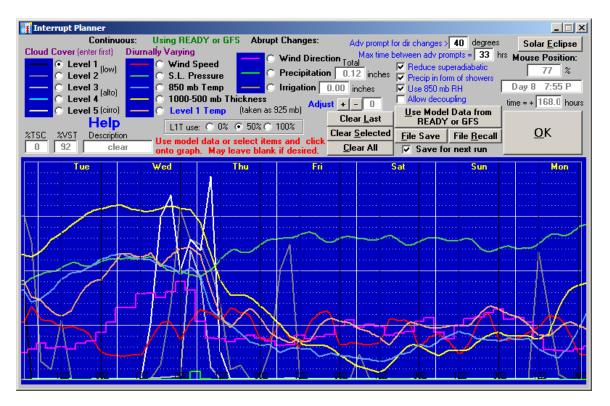


Satisfied with this fit, I clicked OK, to reveal the Interrupt Planner.



This form allows pre-planning of changes in the 13 parameters listed. These items are only partially forecast by WXSIM's own routines, and it needs help – either from you or (more likely) from model data (such as from the GFS, or Global Forecast System). You can select an item, and then use the mouse to click changes straight onto the graph. I do this a lot in calibrating

and customizing. Generally, though, you will have imported GFS data from Chris McMahon (a WXSIM customer in England, and administrator of the weather-watch.com site) or Sam Bohler (a friend of mine here in the U.S.). They kindly (and at no cost to you) provide this data, which they download in the form of huge GRIB files from the U.S. National Weather Service (Chris was already dong this for some of his own products, like MesoMap Live at http://www.weather-display.com/mmlive.php). You can also get the data manually from NOAA's READY site and paste it into your data file (though few people opt for that these days). In either case, just click "Use Model Data from READY or GFS" and you'll see something like this:



The colored lines largely determine how these items will change during the forecast. You can get more detailed readings of them, if you like, by clicking on an item (option buttons at top) and moving the mouse across the graph. Details appear in the boxes at upper right, under the "Solar Eclipse" button. You can also click on the graph to bend or otherwise modify the curves, but most users almost never do, I suppose. (I know one meteorologist who does this daily, though, as he consults all kinds of sources and likes to put his best judgment into WXSIM).

If you imported FOUS, or are using some of the Refinements on the data entry form (such as auto cumulus or diurnal breeze), WXSIM will work out a sort of compromise among the various routines, with forecast results somewhere in between what's on the Interrupt Planner and what other routines wanted to do.

Now for a forecast! Press OK and an output form appears, with text and numeric data pouring across the screen and graphs being drawn as the forecast progresses.

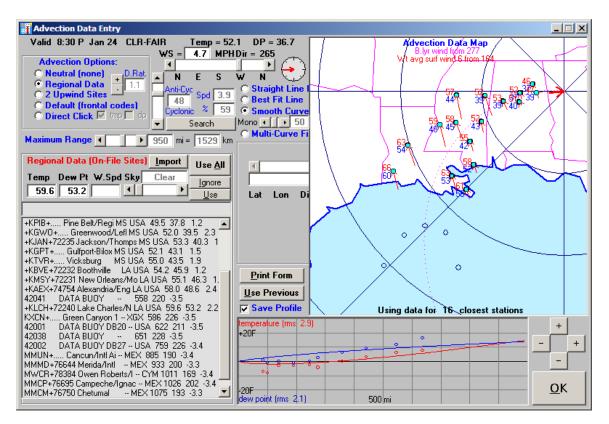
In most forecasts, however, frequent interruptions will occur, due to wind shifts. These can result from FOUS data (I sometimes ignore those, via my response to a message box that pops up), but more often due to data from the Interrupt Planner. You have some control over how

often these happen, using the "Adv prompt for dir changes" setting (the smaller the tolerance in degrees, the more frequent to wind shifts). The question is what to do when this happens.

The interruption will trigger the reappearance of the Advection form. The reason for this is that, after a significant change in wind direction, the earlier advection data and your fit to it become pretty much useless. The air's not coming from those places any more. The best choice (of advection options) from before – Regional Data advection using METAR or SYNOP surface data – is not longer viable, because this is in the future! However, that basic method can still be used.

If you live in or very near the U.S., an excellent choice is MOS (Model Output Statistics) data, from any or (preferably) all of the models producing MOS (NGM, NAM, and GFS). WXSIM can interpolate between the three hourly reports, and average data from all three sources to produce the equivalent of real surface data. Of course, there's some dependence here on outside forecasts, but that's OK; WXSIM is making the best use of everything it can find, and the consensus of three models is generally better than any one alone.

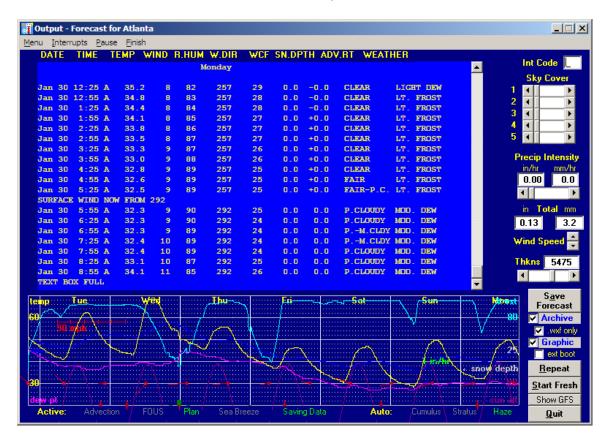
MOS runs out two or three days into the forecast, though, and most of the world has no access to that data. What to do in these cases? The best answer is to import GFS data for advection. This should have been checked for download in WXSIMATE already. It is determined from a grid of 441 (21 x 21) points surrounding your location, and interpolated (and adjusted for elevation) to your existing advection sites. This can last the rest of your forecast, as McMahon has it out to 7.5 days and Bohler out to 10. Below is the result of using GFS for Advection, as if it were real-time surface data:



There are, however, a total of five advection options, and only one is ruled out (Regional Data). One choice is "Neutral", which means no advection at all (other than a separate warming effect

for winds from the direction of the equator). A supposedly better method is the "Default (Frontal Codes)" option. This can be quite accurate if used skillfully, but users will generally use the default "frontal code" that pops up automatically. It generally should be more accurate than Neutral, but has more risk of getting too warm or too cold after major wind shifts. Be sure to read more about these with the blue text help, and in the manual. These extra options (besides Regional Data) are rarely used now, but they can be helpful for experimental use of the program, or if there is ever an internet outage.

Soon, the forecast is done. You can scroll up and down to see all the data that's been output:



After you look at this, you may want to save the forecast, either with a name of your choice, or using the standard archiving option, which saves forecasts with a date and time stamp for later reference. Even if you don't opt to save the forecast in these ways, the latest one is saved anyway, as four different files (including some .csv, or comma-separated variable ones you can view in a spreadsheet program) all starting with "latest".

The saved data files ending in .wxf contain almost all data produced during the forecast. To view any and all saved forecasts, click on File/Retrieve Data:

le Print Options Preferences Location Import	Parameters Output Menu Start H	Help License and Registra	ition	
Save Data				
Retrieve Data (opens wret.exe) DST Exit 5 1 Sunrise Sunset Sun Alt Max S.Al.	Site Name Lat Atlanta 33.65N Status: professional mode ON	84.42W 75W 1033ft	N.Min N.Max N.DP 35 54 30.5	N.W.T 49.3
7:38 A 6:00 P -24 37 Midpoint 1 Midpoint 2 Sun Azi S.R. Azi 10:56 A 8:28 P 262 113	Clouds: Level % Coverage	Opacity	Direction (from) N E S W N	326
Temperature Wind Chill Heat Index 51.0 47 51 C Relative Humidity % Vap.Pres. 10.4 45.7 82.0 48.2 6.8 Dew Pt %RH Wet Bulb Mix.Rat.	2 4 75 3 4 75 3 4 70 4 1 70 5 1 70 Low Clouds Middle broken no		ds Overall Sk	270 270 270 270 270
Barometric Pressure 1005 • mb (hPa) • inches Hg • Station • Sea Level	%TSC 84 2VST 44 Refinements: Soil Data Auto Cumulus	,	JV 0.0 Ozone	300 Iban 74
Wind: Speed 10.5 Use Letters Direction (from) 315 N E S W N	Auto Stratus Auto Haze Dew/Frost: Default Oefault Potential Dew Point 45.7 F 10	Fog: default → def pproximate Visibility	Current Precip Yes Recent Precip Yes Snow/Ice Cover Yes Becent Temps Yes Diurnal Breeze Yes Site to West Yes Stop AM Rain Yes	No No No No

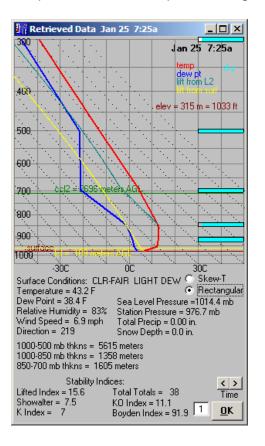
This actually starts another program – wret.exe. This retrieval module is a very powerful tool for displaying far more information than you could see at once in the main program. You can view text or graphics, and can even compare forecast results with actual data from your home weather station, if you use Weather Display (<u>www.weather-display.com</u>), WeatherLink, Virtual Weather Station, or Cumulus. The main form presents all kinds of options:

👫 Data Retrieval for WXSIM 2017, Buik	l 1.0 - © Copyright Tho	mas J. Ehrensperger 2017	
Retrieve data for (time shown here is st Atlanta 33.65 84.42 1033 Jan 23 C: C: Wxsim icons oldfcsts sparefiles wxsimlitedata	andard, not daylight saving)	Temperatures and Thickness (Check up to 15) Temperature Dew Point Max Temp w/Variations Wet Bulb Min Temp w/Variations Wind Chill Agricultural Data Heat Index Level 1 Temperature Soil Depth 1 Boundary Layer Temp Soil Depth 2 Temperature Advection Soil Depth 4	Fahrenheit Celsius 1000-500 thkns 1000-850 thkns 850-700 thkns Friz Lvl (ASL) Friz Lvl (ASL) Snow Lvl (ASL) Snow Lvl (AGL) Snow Lvl (AGL)
Number of days 4 Auto Sele Start Auto Start Auto Directory for saving text and plots: Dep C:\wxsim\ 0 Use Daylight Saving Time? 0 Use letters for wind direction? Make superimposed plots thicker? Text Box Width (adjust to fix alignment issues in View Text) Put com	rliest Date t Omit ✓ Wind Spee Learn-WX Gust 1 min Rng Gust 1 min Gust 1 min Gust 1 min Gust 1 hi Gust 6 hr Weight ecent more X Visible Si Help Sun Altitud Schart Start Sun Altitud Schart Start Schart Start	tion Solar Energy ♥ WH/m ² MJ/m ² Langk Gust ratio Nadjustment Precipitation Rate Precipitation Total e Snow/lee Depth ky Trans. Lifting Cond. Level y Cover er (Lev 1,2) Index Convective Outlooks: ance Conv. Outlook Basis	Tension (kPa) Total epth 1 2 3 4 5 Irrig, ETO Short Ref ETO Long Ref ETO Actual ETO Short Tot
View View Compare to Iext Plots Actuals		• mi/h • km/h • knt • m/s : precipitation in mm, snow depth in cm, visibility in km heit: precipitation and snow depth in inches, visibility in miles	Latent H



Here is an example of plotted data from a retrieved forecast:

You can click anywhere on the graph, after the start of data, to get a vertical sounding of temperature and dew point, along with sky cover and various surface conditions:



The above covers the essentials of making "manual" forecast runs. This is the preferred method in terms of both accuracy and improving forecast experience, IF you have the time and really understand what you're doing. However, you may want (as do I) the convenience of WXSIM forecasting on its own, while you're at work or asleep. You may also want the forecasts uploaded to a web page. The rest of this document describes how to get WXSIM to do these things.

First, you'll need WXSIMATE running automatically to get data to "feed" to WXSIM. In WXSIMATE, select "Schedule" from the top menu bar and you'll see this:

WXSIMATE Auto Scheduler	
Check hours (local time) at which you want automatic downloading	
🗖 1 AM 🗖 1 PM	 Import internet data Import local data
	Suppress error messages
	Close after download and import
▼ 7 AM ▼ 7 PM ■ 8 AM ■ 8 PM	Note: Progress bar may not appear to complete
□ 9 AM □ 9 PM □ 10 AM □ 10 PM □ 11 AM □ 11 PM	Save settings and enable scheduler
Download at 8 minutes past the hour	Save settings but disable scheduler
Archive internet data in this fol	der (enter path below):
c:\wxsim	

You'll almost certainly want "Import internet data" checked. If you want to use data from a home weather station, you'll want "Import local data" checked as well. Archiving data is not necessary for most users and in fact can clutter the WXSIM's folder (usually c:\wxsim).

As you can see, WXSIMATE can auto run as often as every hour. You do need to decide how many minutes after the hour it should run, though. The 8 minutes shown is good for the U.S., as almost all U.S. METAR data is "in" by then. If you are using synoptic data, you might allow a bit more delay. Also, recall that most synoptic data is posted only every 3 or 6 hours, so it wouldn't make sense to collect that every hour (again, METAR is almost always a better choice than SYNOP).

As for what data WXSIMATE will collect, that's simply what you had checked for your last manual run. In other words, your actions running the program manually will "train" WXSIMATE what to do in auto mode. You should watch to see how long WXSIMATE takes to collect your data. This could be anything from seconds to minutes, depending on what all you're collecting and on the speed of your internet connection. If you are sure you want WXSIMATE to run in auto (scheduled) mode, just click "Enable". As confirmation that the scheduler is active, the red text "Auto scheduler ON" will appear just below the "Download Files" button on the main WXSIMATE form.

Now that WXSIMATE is set up, it's time to do the same in WXSIM. Select Start/Auto Run on the top menu bar of WXSIM, and this form appears:

Auto Run and Other Settings	
Auto Run at Settings for before and during run 12AM 12 PM 1AM 1 PM 2AM 2 PM 3AM 3 PM 4AM 4 PM 5AM 5 PM 6AM 6 PM 7 AM 7 PM 8 AM 8 PM 9 AM 9 PM 10 AM 10 PM 14 minutes after the hour OR 0R Heip NOTE: If you need to access Import/Import Data manually, you must temporarily disable Auto Run Mix with bias-corrected external model data via WXSIM-Lite Use XP and later Windows Styles Disable humidity corrections (both learned bias and via WXSIM-Lite) due to faulty station hygrometer. Activate Auto Run With These Settings Disable Auto Run But Keep Settings	Settings for after run Leave output on screen until next run (Do NOT check this unless you want to look at the output before the next run) Activate scheduler on next boot up (Check this if you are using an external program to start WXSIM) Close program after auto run (The following four items are duplicated on the Output form for convenience) Archive .wxf only Graphic External boot By default, WXSIM creates diagnostic log files and comma separated variable files of output data. These are not essential to operation, and producing them may occasionally trigger errors within WXSIM on some computers. You can omit one or both. This setting is saved for future runs, either auto or manual. Omit log files Omit .csv files Use semicolons in .csv files Include day of month in plain text output If you check the option below, the batch file in the box will be executed right after an auto run or after you click 'Repeat' on the Output form. Run optional DOS batch file:

You'll probably want to schedule WXSIM for the same hours as WXSIMATE, but a few minutes later, depending on how long WXSIMATE takes to get all its data. Here, I've chosen a 6 minute delay, which is [perhaps a bit more than necessary, but it's better to err on the long side, just to be sure WXSIMATE has finished. 12 AM is prohibited because it's a bad time for a forecast, since some of the data may be from before midnight and some after midnight. This can cause WXSIM a lot of confusion about the date. During daylight savings time, you should use neither midnight *nor* 1 AM.

Almost all users will want the top box, "Import data before run", checked. This tells WXSIM to get all the data types you last had checked on the Import form. Make sure that the import file name and path (lower left part of Import form) in WXSIM are the same as those for the export file, "File to create", in WXSIMATE.

Check "Import local station data" if you want to use data from your home weather station. Be sure to have carefully selected the items to be imported in WXSIM, as described earlier.

Most users will also want to check "Import advection data before run". WXSIM will then know to use Regional Data advection. The curve smoothing technique will be Smooth/Not Monotone, unless WXSIM believes that a significant near-surface temperature inversion exists, in which case it will use Smooth/Monotone to reduce the chance that nearby topographically dependent temperature variations will throw the profile off. 'Use GFS for initial advection' is generally NOT

recommended; it's really for users on islands or very remote land locations, where few or no nearby surface stations exist.

'Import MOS/GFS advection on wind shifts' is highly recommended. Such data will be handled just like initial Regional Data advection, with the exception that the smoothing method will now be Best Fit Line. This helps smooth out abrupt temperature or dew point changes caused by accumulating disagreements between WXSIM and MOS data as the forecast progresses.

You will probably want to check "Use curvature search for advection". This applies to Regional Data advection both at the beginning of the forecast and after wind shifts. It's generally more accurate, but can make the forecast a bit slow, especially if you are (as is recommended) using MOS or GFS advection and there are a lot of wind shifts.

There remains the decision of whether to use Neutral or Default (frontal codes) advection after subsequent wind shifts, IF other data has run out (which would rarely be the case, anyway). Neutral is perhaps "safer" in that temperature changes will be less abrupt, but I think in the long run Frontal Codes will be more accurate for most people. The frontal code chosen will be the default one, calculated from a variety of factors, including the wind direction and the abruptness of the shift.

The haze setting (0.4 in the example) is needed due to the fact that few METAR or synoptic sites will now report visibilities over 10 miles, or even 10 kilometers (this being largely due to the replacement of human observers by automated instruments in recent years). That actually corresponds to a somewhat significant amount of haze. If I expect generally deep blue skies (when not cloudy) during most of the forecast period, I'll set this rather low. During summer, when haze is common, I may set it at 0.8.

"Leave output on screen until next run" should be checked if you want to come back to the computer, and have the forecast sitting there waiting for you. I actually don't check this (and neither do most users), but instead check the forecast either through the retrieval module or via its posted version on the web.

"Run immediately" lets you do an instant auto run, regardless of the schedule. This is a very good way to preview how the auto run will go. It's also a convenient way to get a quick forecast while you watch – sort of a compromise between a fully automated and a manual run.

Checking "Activate scheduler on next boot up" allows WXSIM to skip the splash screen (the sunset from Mt. Tamalpais near San Francisco) so that WXSIM can resume auto runs even when booted up by another program, like System Scheduler.

Finally, click "Activate Auto Run With These Settings" to activate the scheduler or immediate auto run. If you want to make a manual run after activating auto run, you'll need to specifically "Disable Auto Run But Keep Settings". Otherwise, the program will take off doing undesired actions after you click Full Start.

IMPORTANT POINT: If you need to make changes to certain other forms, such as under Import/Import Data, Import/Import Local Data, or Soil Data, you must "Disable Auto Run But Keep Settings" first; otherwise, an auto run will start and the screens will flash by too quickly for you to make your changes. Just remember to activate auto run again after you've done what you need. I have a computer largely dedicated to weather stuff, including running WXSIM forecasts, so my preference is to leave both WXSIM and WXSIMATE open all the time, running on their own schedulers. I actually have five versions (with differing experimental settings) each running five times a day. The system is robust enough that it will run flawlessly for weeks before some glitch occurs and forces me to fix something.

However, a potentially even more reliable setup - which may also free the computer for other uses when WXSIM isn't scheduled to run - involves opening and closing the programs using a third party program, such as System Scheduler (see

<u>www.splinterware.com/products/wincron.htm</u>). Here is how I used to have it set up (before I decided to leave the programs open all the time). The closing of WeatherLink is no longer necessary, due to improvements I made since this screen shot (from several years ago). One of the three batch files (wxs1.bat) uploads the forecast data to my web site. Wxs2.bat uploads data from the weather station (using files created by WeatherLink) and wxs3.bat copies old forecasts to new names so I can post the 12 previous forecasts.

Application Application	Title Open WXSIMATE Open WXSIM	Last Run 11/23/2007 07:08:00 11/23/2007 07:13:00	Next Run 11/23/2007 13:08:00
Application Application Application Application	Open WXSIM		11/23/2007 13:08:00
 Application 		11/202007 07.10.00	
		1172372007 07:13:00	11/23/2007 13:13:00
 Application 	Open WeatherLink	11/23/2007 07:29:00	11/23/2007 13:29:00
	Open wxs1.bat	11/23/2007 07:27:00	11/23/2007 13:27:00
 Application 	Open wxs2.bat	11/23/2007 13:04:00	11/23/2007 13:34:00
 Application 	Open wxs3.bat	11/23/2007 07:30:00	11/23/2007 13:30:00
 Window Watcher 	Close WXSIMATE	11/23/2007 07:12:00	11/23/2007 13:12:00
 Window Watcher 	Close WXSIM	11/23/2007 07:26:00	11/23/2007 13:26:00
 Window Watcher 	Close WeatherLink	11/23/2007 07:07:00	11/23/2007 13:07:00

There are perhaps many ways to actually upload the forecast output to a web page, including via Weather Display. I decided, though, to create DOS batch files, which can be run at the command prompt (in Windows, go to Start/Run and then type "command"). Here's the batch file I wrote to upload to wxsim.com:

🚺 w	xs1 -	Notepa	ł			
Eile	<u>E</u> dit	F <u>o</u> rmat	View	Help		
ftp	-s:	wxs1.t	txt v	xsim.	com	*
						-
•						1

This opens a simple text file called wxs1.txt, with instructions about what to upload:

w	xs1 -	Notepa	d	_0	×
Eile	Edit	F <u>o</u> rmat	View	Help	
you asc put put put put put put put put put put	rftp ii loc loc loc loc lat lat lat lat lat lat lat lat lat lat	alcal. adat.1 adat.1 adat.1 adat.1 est.1 est.1 est2.1 est2.1 est3.1 est4.1 est4.1 est6.1 est6.1 est6.1 est10. est10. est11. est12. est.wo est.cs est.da ta.txt est.br	txt txt txt txt txt txt txt txt txt txt		•
4				F	1

The two top lines would be your own FTP user name and password to get access to your web site. The files "latest1.txt" through "latest12.txt" are older forecasts, sequentially copied using this batch file:

The Fr	dit F <u>o</u> rmat <u>V</u> iew <u>H</u> elp	
copy copy copy copy copy copy copy copy	latest11.txt latest12.txt latest10.txt latest11.txt latest9.txt latest10.txt latest8.txt latest9.txt latest7.txt latest8.txt latest6.txt latest7.txt latest5.txt latest6.txt latest4.txt latest5.txt latest3.txt latest4.txt latest2.txt latest3.txt latest1.txt latest2.txt latest1.txt latest1.txt	

Notice that one of the uploaded files is plaintext.txt. This file can be parsed by a PHP script (which you post to the same space as plaintext.txt) to provide a nice graphical presentation, an example of which can be seen at

http://wxsim.com/wxsimatl.php

The script I used is a slightly customized version of one written by Ken True, freely available at

http://saratoga-weather.org/scripts-WXSIM.php

You can even publish forecasts in several different languages, using scripts arranged by Ken with the help of WXSIM users in many countries. A discussion forum for WXSIM can be found at <u>www.weather-watch.com</u>, as a section of the Weather Watch Forum.

There are many options for using the WXSIM system, and I hope you'll explore them. WXSIM can be as much a learning tool as a forecasting tool. Please read the manual, as time permits, and click on all the blue text help.

Tom Ehrensperger

February 5, 2017