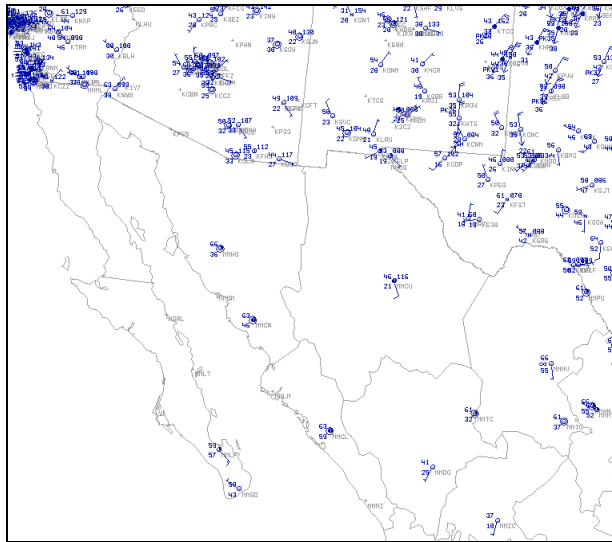


EMAS – Automated Surface Weather Stations in Mexico

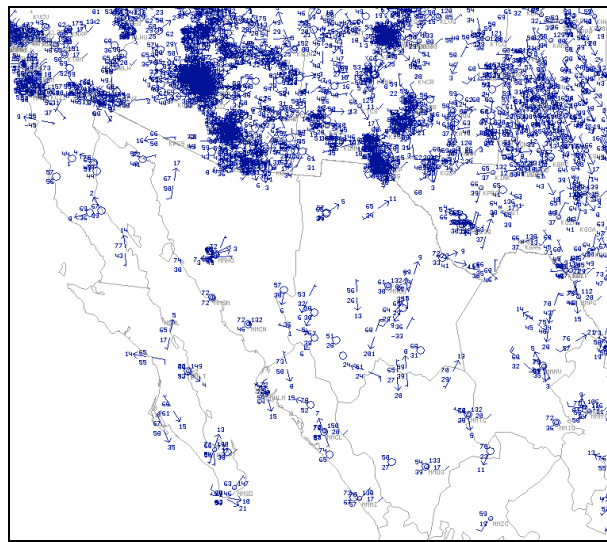
Mike Hardiman, NWS Santa Teresa, NM (EPZ)
Last Update: 26 April 2010

Over the past year or two, Mexico's national weather service, *El Servicio Meteorológico Nacional*, has quietly made available via its website raw observations from a growing nationwide network of automated weather stations. Most stations transmit a variety of elements including Temperature, RH, Wind, Gusts, and Accumulated Precipitation. The data is available in 10-minute and hourly time steps. While the data is fairly reliable, there is often a 2-3 hour delay before the latest observations are available. Even with the delay, the data has proven useful for determining surface conditions south of the border, especially during the Southwest Monsoon.

These instructions will allow you to install a simple LDAD script and AWIPS configuration files to allow you to add these additional Mexican observations to AWIPS as part of the LDAD mesonet.



Standard METAR Plot (Density = Max)



METAR + Mesonet Plot w/EMAS (Density = Max)

Installation and Configuration

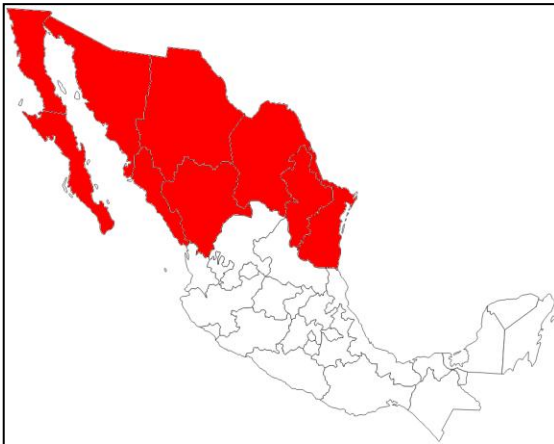
- 1.) As user 'ldad' on LDAD (ls2 or ls3), copy EMAS.tar into /data/ldad/localapps/getMesonet/, and expand the tar archive. This will create the "getEMAS" subdirectory. (See Below!)

At EPZ, all local scripts, programs, etc that run on LDAD reside in /data/ldad/localapps/. Everything in this directory automatically rsyncs from 'ls2' to 'ls3.' Anything mesonet-related is kept in the subdirectory 'getMesonet.' You may need to create the various sub-directories separately. If you choose to use a different directory than what is shown in the examples, be sure to make the necessary changes to variables in the getEMAS.csh script.

```
> ssh ldad@ls
> cp <WHEREEVER_IT_IS>/EMAS.tar /data/ldad/localapps/getMesonet/
> cd /data/ldad/localapps/getMesonet/
> tar -xvf EMAS.tar.gz
```

2.) In the getEMAS directory, you will find several files:

EMAS.desc	AWIPS configuration file that describes the placement of elements in the raw data files (csv) that are sent to AWIPS via LDAD.
EMAS.list	Lists the stations to download, and their host observing network. (For more info on observing networks, see later section).
EMASStation.txt	AWIPS configuration file which lists stations and metadata (location, name) for AWIPS processing. Stations must appear in both this file and EMAS.list in order to be processed.
getEMAS.csh	The LDAD script that does all the work.
msas_qc.EMAS.desc	AWIPS configuration file for MSAS. Should closely match EMAS.desc.



Included Stations:

By default, stations from northern Mexico states are included in the station lists. This includes Baja California (Norte and Sur), Sonora, Sinaloa, Chihuahua, Durango, Coahuila, Nuevo Leon, and Tamaulipas.

Trimming the Station List:

To trim unwanted stations from the download list, simply remove their entries from 'EMAS.list.' You should also remove the unwanted stations from EMASStation.txt, though this is technically not necessary.

Adding to the Station List:

Please see Appendix A for details.

3.) Copy configuration files to AWIPS. As user 'fxa' on any AWIPS server:

```
> ssh dx1
> su - fxa
> cd /data/fxa/LDAD/data/
> scp ldad@ls:/data/ldad/localapps/getMesonet/getEMAS/EMAS.desc .
> scp ldad@ls:/data/ldad/localapps/getMesonet/getEMAS/EMASStation.txt .
> scp ldad@ls:/data/ldad/localapps/getMesonet/getEMAS/msas_qc.EMAS.desc .
```

4.) As user 'ldad' on any AWIPS server, add a line for EMAS to LDADinfo.txt:

```
> ssh px2
> su - ldad
> cd /data/fxa/LDAD/data/
> cp LDADinfo.txt LDADinfo.txt.OLD
> gedit LDADinfo.txt
```

Add the following to LDADinfo.txt:

```
# Mesonet Data - Internet
EMAS |EMAS |87 |86 |CVS TYPE |mesonet | |
```

- 5.) Run a -station localization on all workstations and servers. (The last command listed below should be all on one line. Add extra workstations as necessary.):

```
> ssh dx1
> su - fxa
> sh
> for i in dx1 dx2 dx3 dx4 px1 px2 lx1 lx2 lx3 lx4 xt1 xt2 xt3 xt4; do echo
$i; ssh $i /awips/fxa/data/localization/scripts/mainScript.csh -station;
done
```

- 6.) Restart the LDAD process on px2 (as user 'ldad'):

```
> ssh px2
> su - ldad
> stopLDAD.sh
> startLDAD.csh
```

- 7.) Back on LDAD, make any needed changes to the variables in getEMAS.csh. This should only be necessary if you installed in a different directory than indicated in these notes.

- 8.) On LDAD as user 'ldad,' make sure getEMAS.csh is executable:

```
> chmod 775 getEMAS.csh
```

- 9.) On LDAD as user 'ldad,' Try running getEMAS.csh manually:

```
> cd /data/ldad/localapps/getMesonet/getEMAS/
> ./getEMAS.csh
```

You should see a streaming of output, mostly from the 'wget' program which downloads the text data files. Depending on how many stations you kept in EMAS.list, this could take a minute or two.

When the script is finished, check the contents of the getEMAS/raw directory. It should contain several files with syntax similar to "CH31_60M.TXT" as well as "EMAS.dat."

The file getEMAS/raw/EMAS.dat should contain comma-delimited data similar to:

CH23,2010/04/21 18:00:00,201,0.78,3.25,26.3,31,857.5,0.0
CH22,2010/04/22 01:00:00,,,,,,,,,
CH22,2010/04/22 00:00:00,,,,,,,,,
CH22,2010/04/21 23:00:00,212,7.36,20.20,31.2,11,874.9,0.0
CH22,2010/04/21 22:00:00,224,12.95,35.90,31.7,10,875.5,0.0
CH22,2010/04/21 21:00:00,210,12.31,33.60,31.5,11,876.8,0.0

- 10.) Check to ensure EMAS.dat has been copied over to the proper LDAD directories. It should show up in either /data/Incoming/ or /data/ldad/Processed/.

- 11.) Restart D2D, plot Mesonet Data from the 'Obs' menu and 'LDAD Stations' from the 'Maps' menu. EMAS Station labels should show up (try increasing frame data density to 'Max'), and data should plot (but could be a few hours old).

- 12.) If all goes well, add getEMAS.csh to the LDAD crontab, running it once hourly.

Appendix A – EMAS Observing Networks and Adding Stations

Originally, SMN disseminated observations solely from their own national network of automated weather stations (Estaciones Meteorológicas Automáticas Superficie, or EMAS). These stations all reported the same elements: Wind Direction, Wind Speed, Wind Gust, Temperature, Relative Humidity, Barometric Pressure, Accumulated Liquid Precipitation, and Solar Radiation.

However, in early 2010, SMN began carrying observations from several other national and regional networks, which report a variety of hydrometeorological elements.

This made automatic parsing of the data a little more complicated, as the order and availability of elements differed from network-to-network.

By default, the getEMAS.csh script is setup to retrieve data from 5 networks available across several northern states: the “original” SMN EMAS stations, SMN ESIME (Estación Sinóptica Meteorológica), SEMAR (Secretaría de Marina), OCRB (Organismo de Cuenca de Rio Bravo), and OCGN (Organismo de Cuenca de Golfo Norte).

SMN EMAS stations appear to be “gap-filler” automated stations which report via satellite every ten minutes. SMN ESIME stations are automated stations co-located at several Mexican Synoptic Surface Observation sites (“meteorological observatories”) which also report every 10 minutes. SEMAR stations are found along the coast and in harbors, OCRB stations are hydromet stations within the Rio Bravo (Rio Grande) basin, and OCGN stations are hydromet stations within the “Golfo Norte” basin.

Within a few of the networks, there appear to be different classes of stations, as not all the stations within a specific network necessarily transmit the same elements.

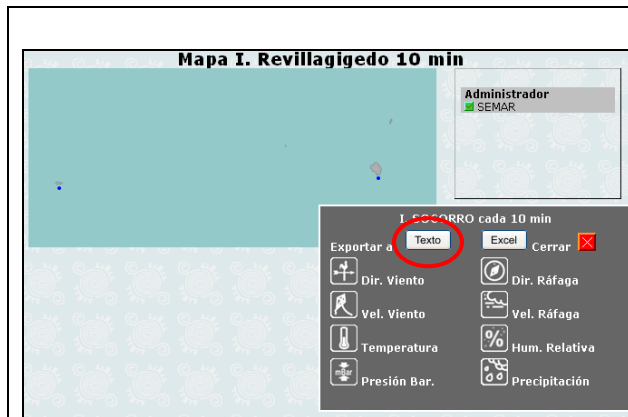
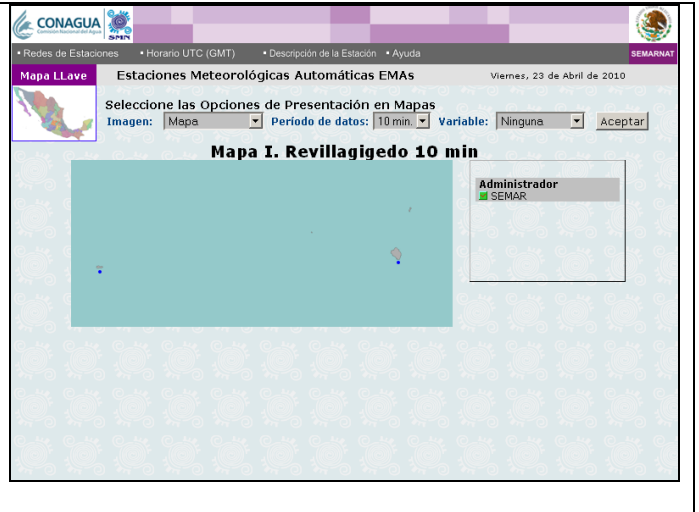
The script getEMAS.csh is not fancy. There is probably a much easier way to do what it does using perl or some other scripting language (If someone wants to do a re-write, be my guest, but please share the code!). Basically the script checks the network indicated in EMAS.list for each station, then downloads the data and parses it based on the known (hard-coded) format associated with the network. Both the available elements, and the order of those elements in the data files, is important.

SMN EMAS SMN ESIME	DIRS	DIRR	VELS	VELR	TEMP	HR	PB	PREC	RAD-SOL	
SEMAR1	DIRS	DIRR	VELS	VELR	TEMP	HR	PB	PREC		
SEMAR2	VELS	DIRS	TEMP	HR	PB	PREC				
OCGN	NIVEL	PREC	TEMP	VELS	DIRS	VELR	DIRR	HR		
OCRB1	NIVEL	PREC	TEMP	VELS	DIRS	VELR	DIRR	HR	RAD-SOL	PB
OCRB2	PREC	TEMP	VELS	DIRS	VELR	DIRR	HR	RAD-SOL	PB	
OCRB3	NIVEL	PREC								

***DIRS** = Wind Direction, **DIRR** = Gust Direction, **VELS** = Wind Speed, **VELR** = Gust Speed, **TEMP** = Temperature, **HR** = Rel. Humidity, **PB** = Barometric Pressure, **PREC** = Precip Accumulation, **RAD-SOL** = Solar Radiation, **NIVEL** = River Stage Height (?)*

If you wish to add stations to download and store, and the stations are part of the above listed networks, then it is a fairly easy task to accomplish.

First, browse to the EMAS website at <http://smn.cna.gob.mx/emas/>. Click on the state or area of interest. In this example, we'll use the Revillagigedo Islands, which are far off the coast of Colima.



There are just two SEMAR stations in the Revillagigedo Islands. (Normally if more than one network is present, you can click on the green check boxes to “turn off” networks, making them disappear from the map.)

Click on the blue dot on the eastern-most island. This is the SEMAR station located on Isla Socorro.

A grey box will pop up giving you several options. Click on the “Texto” button.

Estaciones Automáticas

Estación: I. SOCORRO, COL
Operad por: SEMAR
Longitud: 114°44'00" Longitud: 18°20'30" Altitud:

DI/MN/AAAA	HH:MM	DIRS	DIRR	VELS	VELR	TEMP	HR	PB	PREC
22/04/2010	19:00	280	276	18.80	25.20	28.1	49	1008.7	0.0
22/04/2010	19:15	284	283	15.90	21.80	28.0	50	1008.6	0.0
22/04/2010	19:30	263	269	18.60	25.80	26.8	55	1008.2	0.0
22/04/2010	19:45	34	49	18.60	26.90	26.4	55	1008.4	0.0
22/04/2010	20:00	346	353	16.40	27.50	26.4	55	1008.2	0.0
22/04/2010	20:15	359	83	14.60	22.90	26.6	54	1008.0	0.0
22/04/2010	20:30	35	34	23.20	36.70	26.1	55	1007.7	0.0
22/04/2010	20:45	24	28	20.20	32.10	25.8	57	1007.5	0.0
22/04/2010	21:00	37	8	21.50	34.40	26.0	57	1007.3	0.0
22/04/2010	21:15	42	35	24.60	35.60	24.9	61	1007.1	0.0
22/04/2010	21:30	30	44	22.90	36.20	24.9	60	1007.0	0.0
22/04/2010	21:45	31	34	23.40	38.50	25.4	57	1006.6	0.0
22/04/2010	22:00	23	41	21.80	37.30	25.7	55	1006.3	0.0
22/04/2010	22:15	20	351	19.00	32.10	26.2	52	1006.4	0.0
22/04/2010	22:30	12	43	19.00	29.20	26.5	51	1006.2	0.0
22/04/2010	22:45	333	359	19.60	36.70	26.9	52	1006.3	0.0
22/04/2010	23:00	36	35	25.30	37.90	26.1	57	1006.1	0.0
22/04/2010	23:15	38	43	26.20	37.90	24.9	61	1006.0	0.0
22/04/2010	23:30	44	39	26.00	33.30	24.7	61	1006.0	0.0
22/04/2010	23:45	38	63	25.50	39.00	24.7	61	1006.2	0.0
23/04/2010	00:00								
23/04/2010	00:15								

A new browser window or tab will pop up with a text listing of data. In this Window, note the raw file name, which starts with the Station ID (CO02). Also note the Station Name, as well as the Latitude/Longitude and Altitude (if listed).

Also note the listing and order of variables and compare to the table on the previous page. This data file's format matches up with the “SEMAR1” network.

Convert the Lat/Lon coordinates to decimal degrees. In this example, Latitude 18°20'30" becomes 18.3417°. (Take 30", divide by 60, add the result to 20', then divide that by 60, then add 18°).

Back on LDAD, add the station information to EMAS.list. The placement within the file does not matter.

In our example, the line would look like:

```
CO02|SEMAR1|ISLA SOCORRO
```

Next edit the LDAD copy of EMASStation.txt, adding more station data. Again, the order of the stations is not important, and it does not need to match up with the order of stations in EMAS.list. For our example, the added line would look like:

```
CO02|CO02|ISLA SOCORRO      |    0.000|18.3417|-114.7333|GMT|||1|||
```

(In this case, no elevation was listed. We can assume SEMAR stations are fairly close to sea level, so the altitude was entered as 0.000 meters).

Next, as user 'fxa' on any AWIPS server, copy EMASStation.txt from LDAD to /data/fxa/LDAD/data/.

```
> ssh dx1
> su - fxa
> cd /data/fxa/LDAD/data/
> scp ldad@ls:/data/ldad/localapps/getMesonet/getEMAS/EMASStation.txt .
```

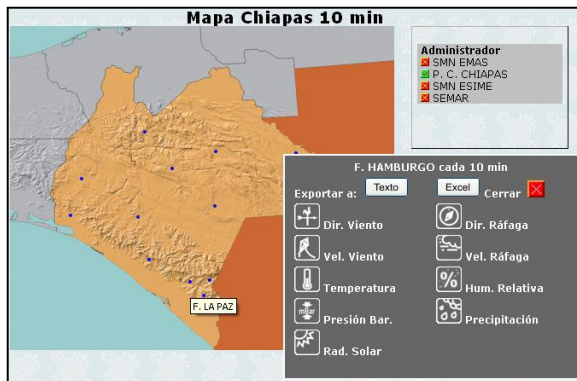
Next, as user 'fxa' run a --stations localization on all workstations/servers:

```
> ssh dx1
> su - fxa
> sh
> for i in dx1 dx2 dx3 dx4 px1 px2 lx1 lx2 lx3 lx4 xt1 xt2 xt3 xt4; do echo
  $i; ssh $i /awips/fxa/data/localization/scripts/mainScript.csh -station;
done
```

Then restart the LDAD processes on px2 (as user 'ldad'):

```
> ssh px2
> su - ldad
> stopLDAD.sh
> startLDAD.csh
```

Adding Data from “Unsupported Networks”

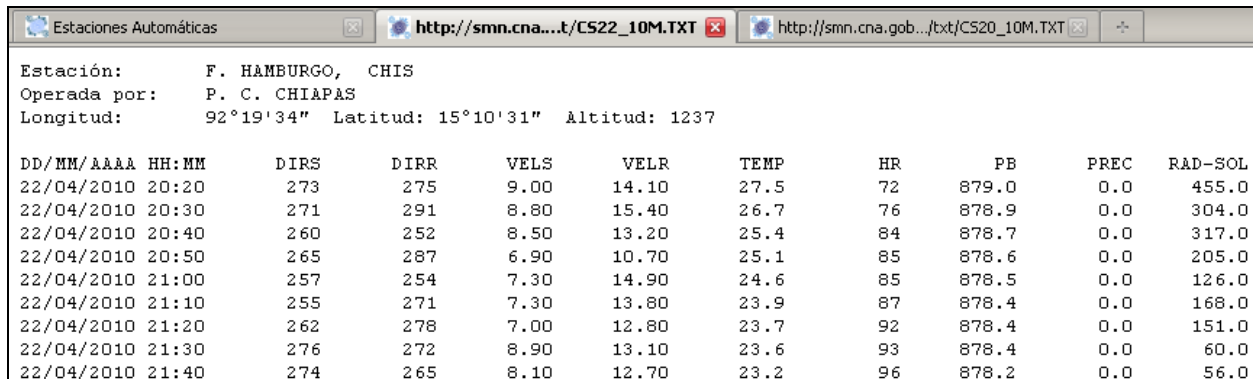


If you're looking to add data from a network not currently "supported" by the getEMAS.csh script, then things may become a little more tricky.

For example, let's take a look at the state of Chiapas, which operates several stations within its own network, "P.C. Chiapas."

In this case, we're in luck. The order and availability of elements matches that of the "SMN EMAS" and "SMN ESIME" networks.

So, all we have to do is add the station information like we did for the earlier example, and make one quick and easy edit to the getEMAS.csh script.



DD/MM/AAAA HH:MM	DIRS	DIRR	VELS	VELR	TEMP	HR	PB	PREC	RAD-SOL
22/04/2010 20:20	273	275	9.00	14.10	27.5	72	879.0	0.0	455.0
22/04/2010 20:30	271	291	8.80	15.40	26.7	76	878.9	0.0	304.0
22/04/2010 20:40	260	252	8.50	13.20	25.4	84	878.7	0.0	317.0
22/04/2010 20:50	265	287	6.90	10.70	25.1	85	878.6	0.0	205.0
22/04/2010 21:00	257	254	7.30	14.90	24.6	85	878.5	0.0	126.0
22/04/2010 21:10	255	271	7.30	13.80	23.9	87	878.4	0.0	168.0
22/04/2010 21:20	262	278	7.00	12.80	23.7	92	878.4	0.0	151.0
22/04/2010 21:30	276	272	8.90	13.10	23.6	93	878.4	0.0	60.0
22/04/2010 21:40	274	265	8.10	12.70	23.2	96	878.2	0.0	56.0

In this case, we'll simply call the P.C. Chiapas network "CHIAPAS" in the EMAS.list file. (See the directions for the earlier example for details on adding stations and running localization).

In the getEMAS.csh script, look for the following line:

```
if ($NETWORK[$n] == "EMAS" || $NETWORK[$n] == "ESIME" || $NETWORK[$n] ==  
"SEMAR1") then
```

Change the above line to add "CHIAPAS" then save the script file:

```
if ($NETWORK[$n] == "EMAS" || $NETWORK[$n] == "ESIME" || $NETWORK[$n] ==  
"SEMAR1" || $NETWORK[$n] == "ESIME" || $NETWORK[$n] == "CHIAPAS") then
```

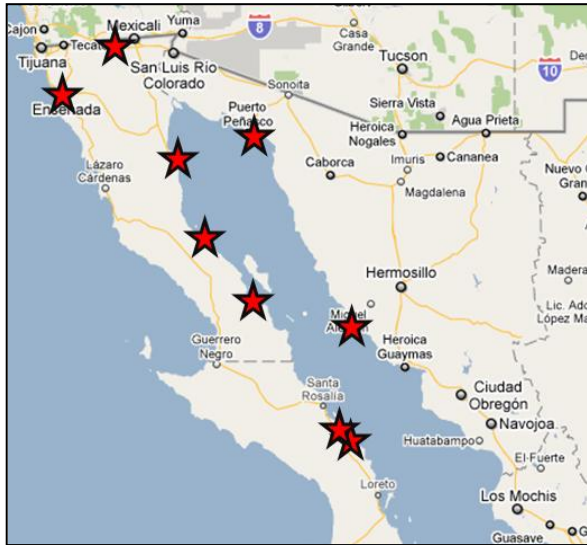
If you are looking to add stations from a network whose observation elements do not fit any of the already-supported networks, you will have to add a new section to the script which parses the elements. A cursory look at other networks indicates that most, if not all networks currently hosted by SMN are similar in format to already supported networks.

Appendix B – Other Sources for Mexican Surface Data

While SMN EMAS is the probably the largest single source of Mexican Surface Observations, there are several other sources available via the web.

MADIS Mesonet Feed

A handful of Mexican observations can be found in the MADIS feed, primarily in the APRS/CWOP network. Most of these can be found in larger cities like Hermosillo, SON, where regular METAR observations are already available.



Weather Underground

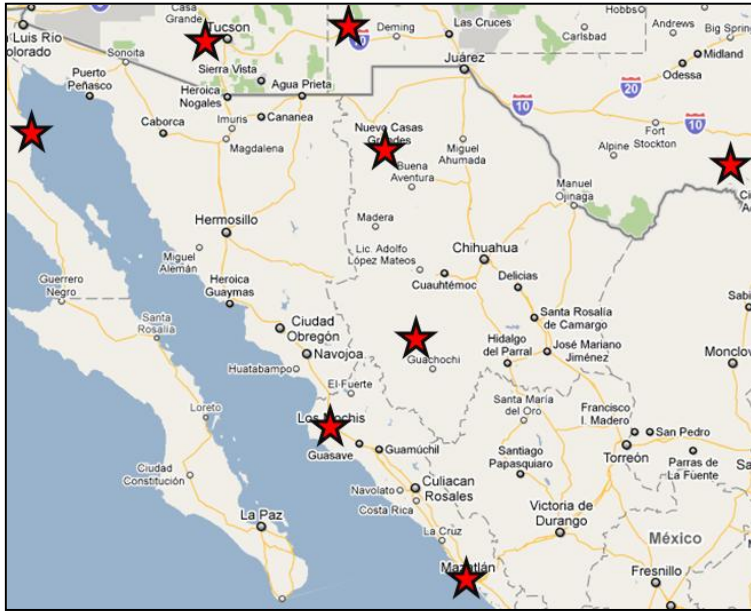
Several reliable personal weather stations from both the U.S. and Mexico are available via the Weather Underground (WU), including several stations along the coast of the Sea of Cortez (Gulf of California) which can be very helpful with tracking the northward progression of low level moisture and “Gulf Surge” events during the Southwest Monsoon.

The following URL can be used to directly access the WU weather stations, just replace <StationID> with the actual station ID (see table):

A few WFOs ingest WU data into AWIPS, but widespread downloads of may be “frowned upon” by WU. (Email me for more info...)

<http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=<StationID>>

Select WU Stations of Interest to Border WFOs		
SON	Puerto Penasco (Rocky Point)	ISONORAP1
SON	Bahia Kino	ISONHERM2
BCN	San Felipe	IBAJACAL29
BCN	Agua de las Flores	IBAJANOR1
BCN	Bahia Gonzaga	IBAJANOR2
BCN	La Rumorosa	IBAJACAL21
BCN	Ensenada	IBAJACAL13
BCS	Mulege	IBCSMULE1
BCS	Bahia Concepcion, El Burro Cove	IBAJASUR2



Davis Weather Link

Davis Weather Link is a relatively new mesonet source, but is already host to several stations in otherwise data sparse areas of both the United States and Mexico.

The following URL can be used to directly access the Davis Weather Link stations, just replace <UserID> with the actual user ID (see table):

Davis WeatherLink data can also be ingested into AWIPS, but the same cautions apply as with the Weather Underground. (Again, send me an email for more info).

<http://www.weatherlink.com/user/<UserID>/index.php?view=summary&headers=1&type=2>

Select Davis Stations of Interest to Border WFOs		
BCN	Percebu	tutton
CHH	Colonia Dublan (near Nuevo Casas Grandes)	marvinlonghurst
CHH	Los Napuchis	mexicomedical
SIN	Los Mochis	jorgegarciaf
COA	Torreon	cie
AZ	Three Points (West of Tucson)	goret1
NM	Lordsburg 1 SE	lordsburg
TX	Comstock 29 NW (4M Ranch)	tbmiller

CEDO Weather Station in Puerto Penasco, Sonora

Although likely of limited interest, another weather station located near Puerto Penasco (Rocky Point), Sonora is available on the web from CEDO (Centro de Estudios de Desiertos y Océanos). Instructions on how to ingest this observation into AWIPS via LDAD are available by request. This coastal station is useful for monitoring Gulf Surge events during the Southwest Monsoon.

http://www.cedointercultural.org/Current_Monitor_original.htm

Estación: Buena Vista - Municipio: Janos

Ultima lectura:
Fecha: Lunes, 26 de abril de 2010
Hora: 8:45
* Zona horaria: -1 hrs. Hora Central

Variables	Valor	Unidades	Estado actual
Temperatura	23.8	°C	
Precipitación	0	mm	
Humedad relativa	21	%	
Punto de rocío	0.19	°C	
Radiación global	643.7	w/m²	
Velocidad del viento	0	km/hr	
Dirección del viento	128.5	grados azimut	

Agroclimate Network (Red Nacional de Estaciones Estatales Agroclimatológicas)

INIFAP (Instituto Nacional de Investigaciones Forestales, Agrícolas, y Pecuarias) hosts a website that publishes surface data from individual state networks of weather stations located mainly in agricultural areas of Mexico. The quality, timeliness, and availability of data varies from state-to-state, but the network is quite dense in some locations, especially in coastal Sonora and Sinaloa. Data from these stations may be especially helpful for tracking Gulf Surge events, and there appears to be some archived data accessible.

Data from these stations cannot currently be ingested into AWIPS, since the data pages include small Adobe Flash animations. Attempts to access the pages using 'wget' or text-based web browsers in Linux automatically

redirect the requests to a page telling the viewer they need a Flash-capable browser. (If anyone knows of any work-arounds, email me. I've tried several methods.)

<http://clima.inifap.gob.mx/redclima/>

