



Republic of Turkey
Ministry of Environment And Forestry
Turkish State Meteorological Service



APPLICATIONS OF TURKISH METEOROLOGICAL SERVICE in TURKEY

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Introduction: International Relations of TSMS



WMO



EUMETSAT



ECMWF



ECOMET



EUROCONTROL

EUROCONTROL



ALADIN

Observation Network: In general (continued)

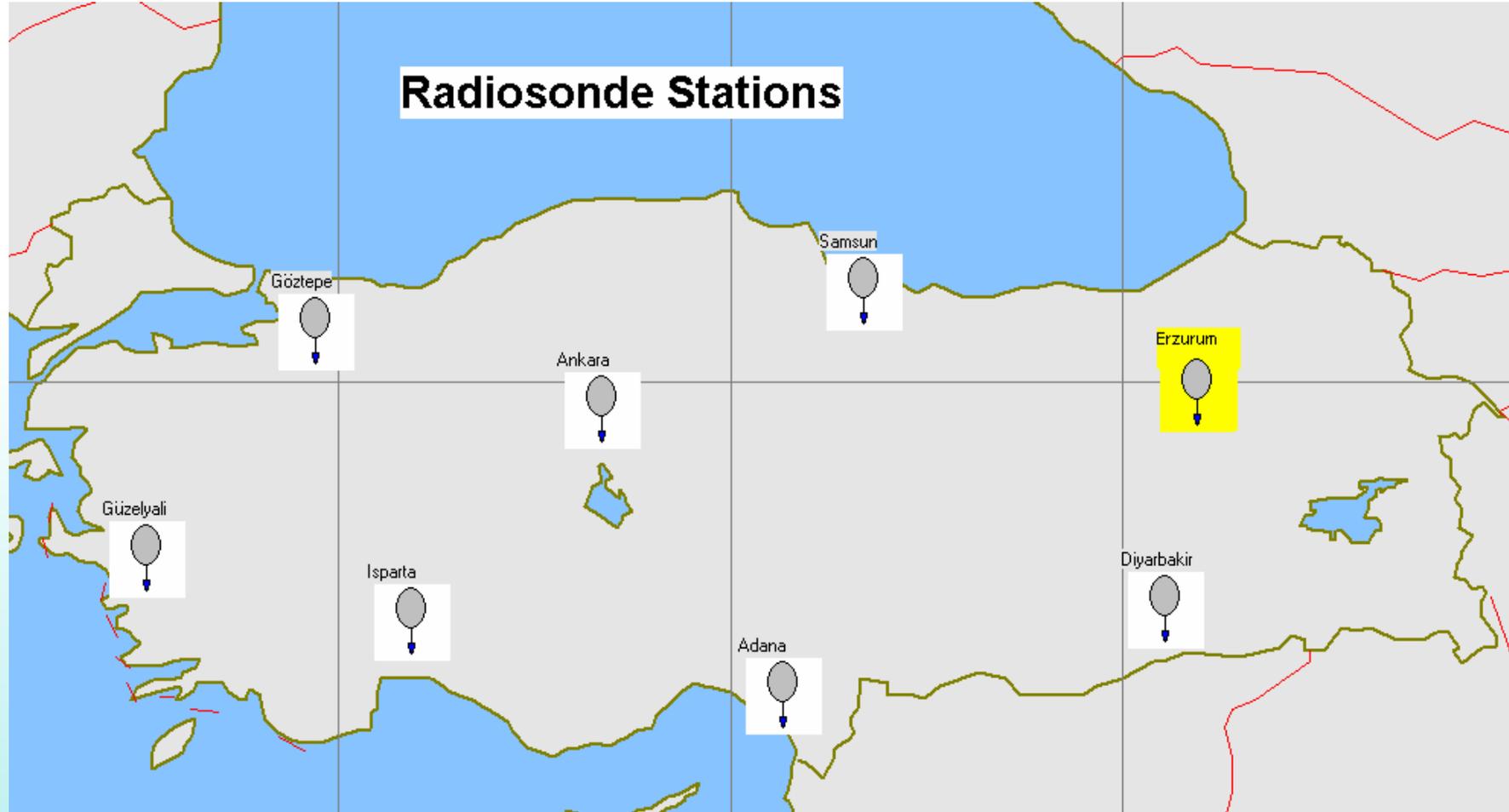
- To be able to observe the weather and to give the best meteorological services to the users, TSMS has to operate almost 600 stations of several types and purposes.
- Climatologic stations (350 / 350 automated)
- Upper-air (radiosonde) (8)
- Synoptic stations (110 / 110 automated)
- Airport stations (60 / 43 automated)
- Doppler weather radars (4)

Observation Network: In general

It is also planned to install additional 200 AWOS stations by 2010 to complete the modernization program of surface observation network. Thus, TSMS will have a fully automated surface observation network as follows by 2010:

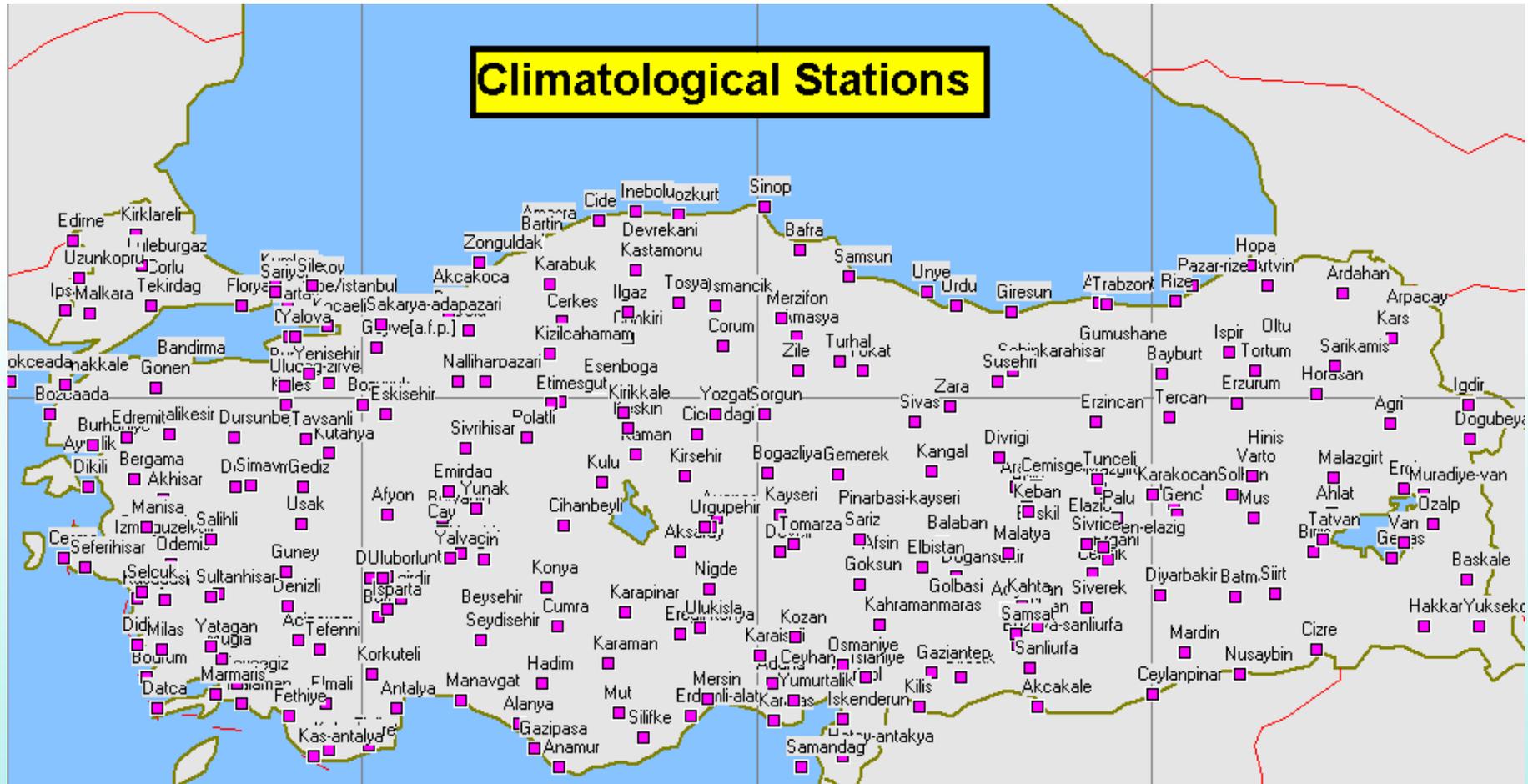
- Climatologic stations – 556 (all automated)
- Synoptic stations – 125 (all automated)
- Airport stations – 60 (all automated)

Observation Network: Upper Air Observing Network



8 stations; 2 observations per day at each station at 00:00 UTC and 12:00 UTC

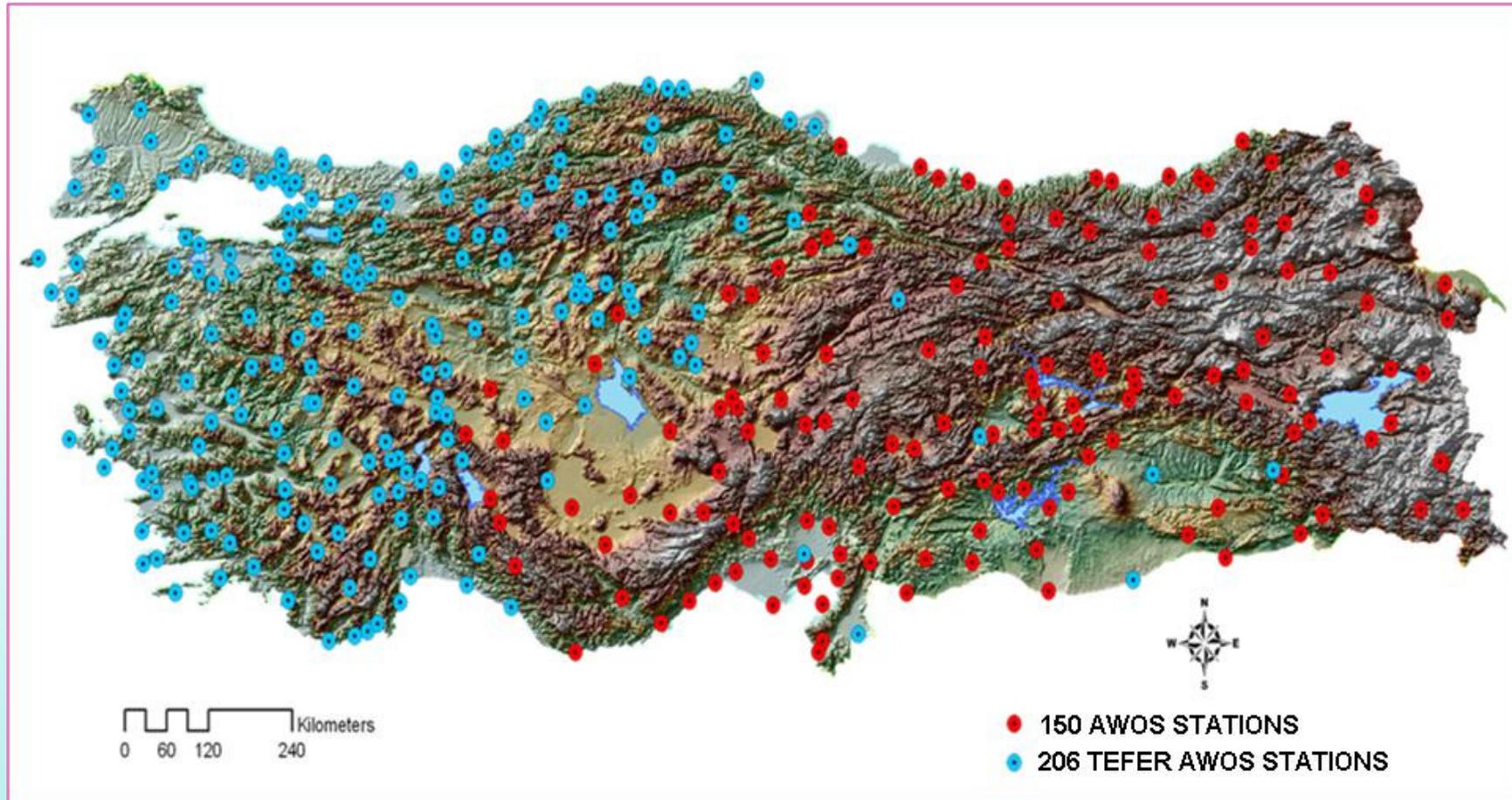
Observation Network: Surface Observing Network (Climatological Stations)



350 stations, 350 with AWOSs



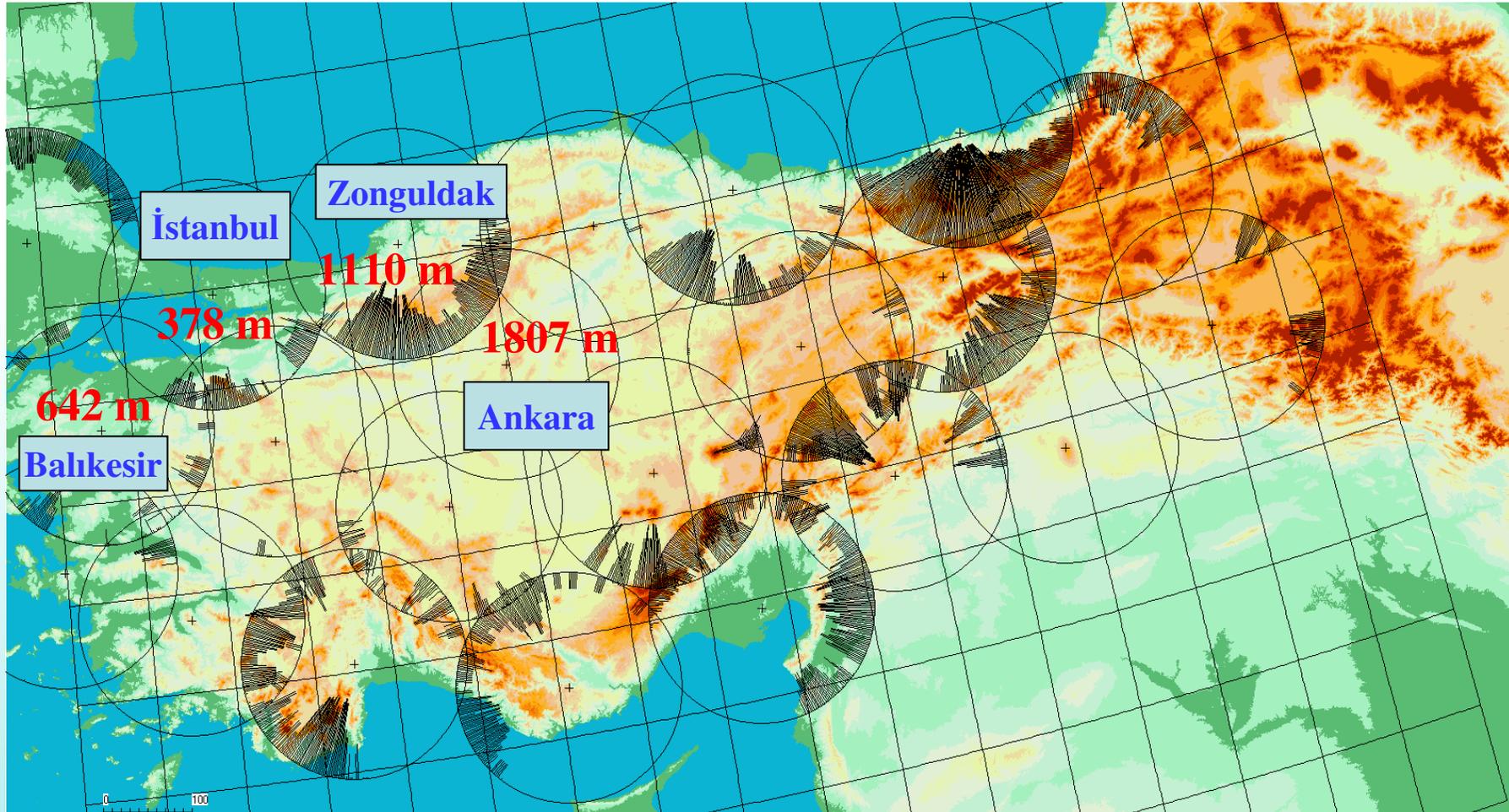
Observation Network: Automated Meteorological Observing Stations



Observation Network : Radar Network of TSMS

- TSMS has been operating four radars which have:
 - C band, one dual polarity
 - Klystron amplifier
 - Digital receiver
 - Beam width less than 1 degree.
- Ankara Radar was one of the first dual polarization radars around Europe.

Observation Network : Radar Network of TSMS



Observation Network : Radar Project

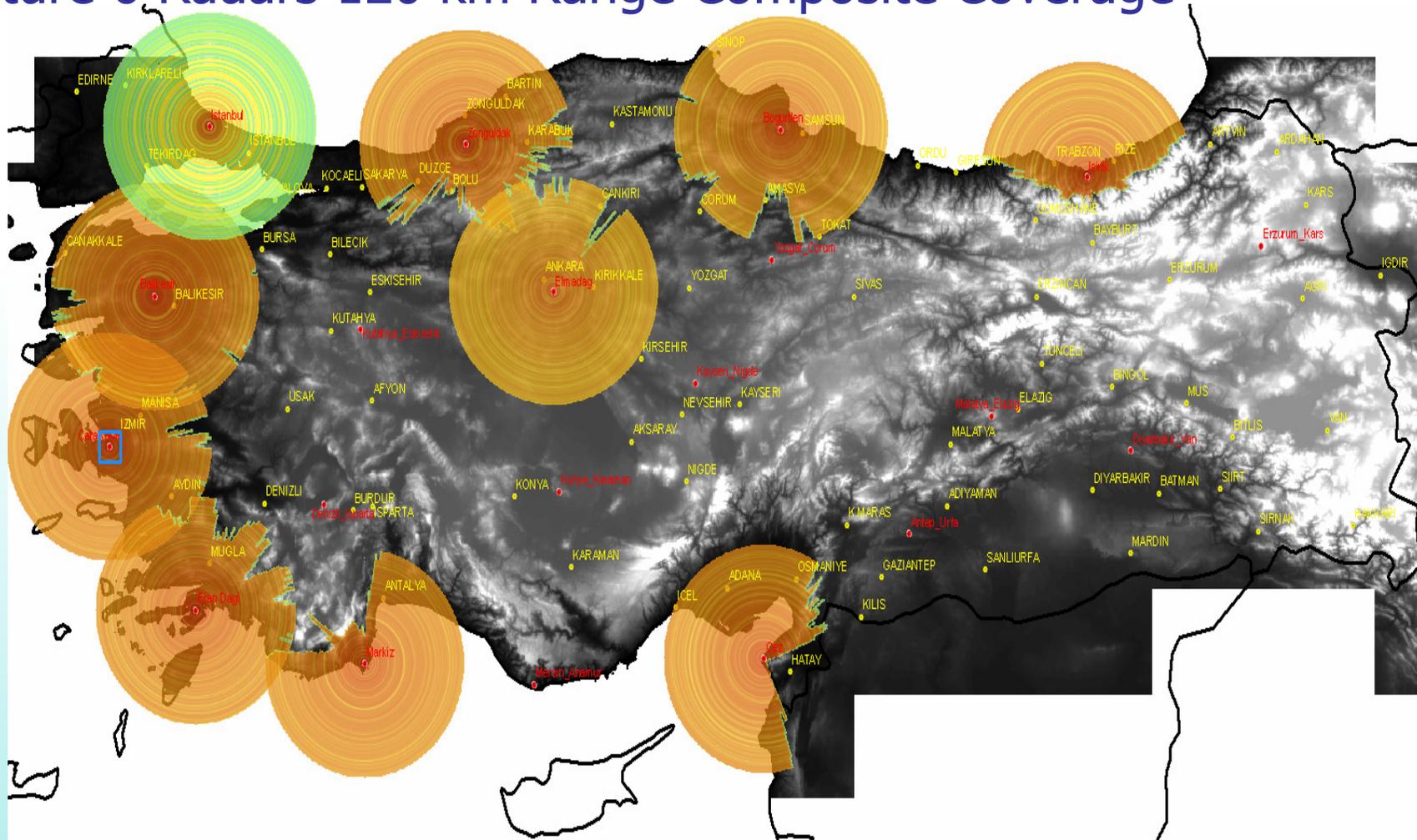
TSMS will install 6 new radars between 2009 and 2012 in following radar sites:

- Antalya (dual polarization)
- İzmir (dual polarization),
- Muğla (dual polarization),
- Adana/Hatay (dual polarization),
- Samsun,
- Trabzon/Rize





Observation Network : Radar Feasibility Study Present 4 + Future 6 Radars 120 km Range Composite Coverage



Observations

Remote Sensing Satellite



Meteorological Satellites and their products

Geo-stationary	Meteosat: Meteosat-8 Meteosat-9	Spatial Resolution: 3 Km	Temporal Resolution: 15 min.
Polar Orbiting	NOAA-17 NOAA-18	Spatial Resolution: 1,1 Km	Temporal Resolution: 4 images per day
Polar Orbiting	METOP-A	Spatial Resolution: 1,1 Km	Temporal Resolution: 2 images per day



Telecommunication

Lines & Connections

International

To predict the weather, modern meteorology depends upon near instantaneous exchange of weather information across the entire globe (WMO).

This requires strong international and national telecommunication infrastructure.

TSMS has strong International Links

RMDCN Links (768 kb/s)

(Reading-U.K.-ECMWF)
(Offenbach-Germany-WMO RA VI, RTH)
(Rome-Italy-WMO RA VI, RTH)

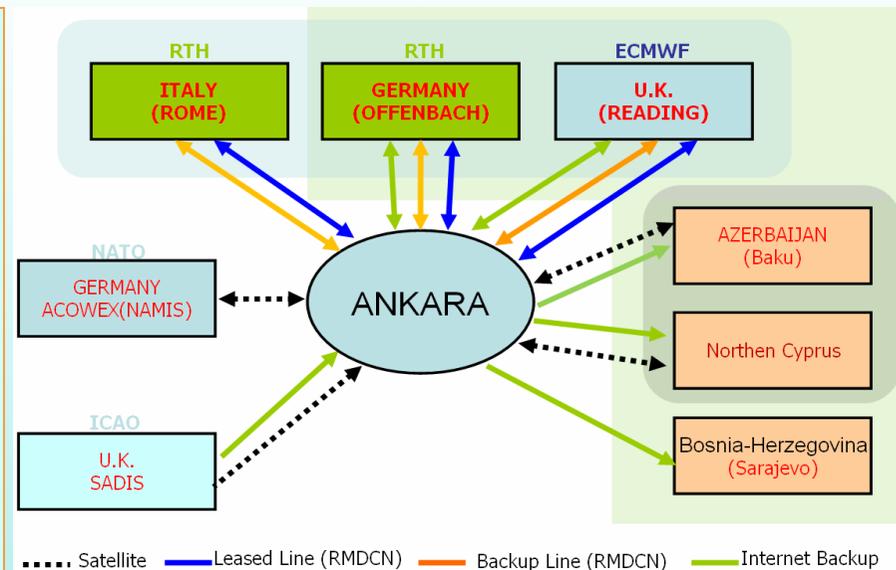
SADIS2G (U.K.-ICAO)

NAMIS (Germany-NATO)

VSAT (4 in Northern Cyprus, 2 in Azerbaijan)

Internet Connections (backup)

Ground Receiving Stations for Satellite Images



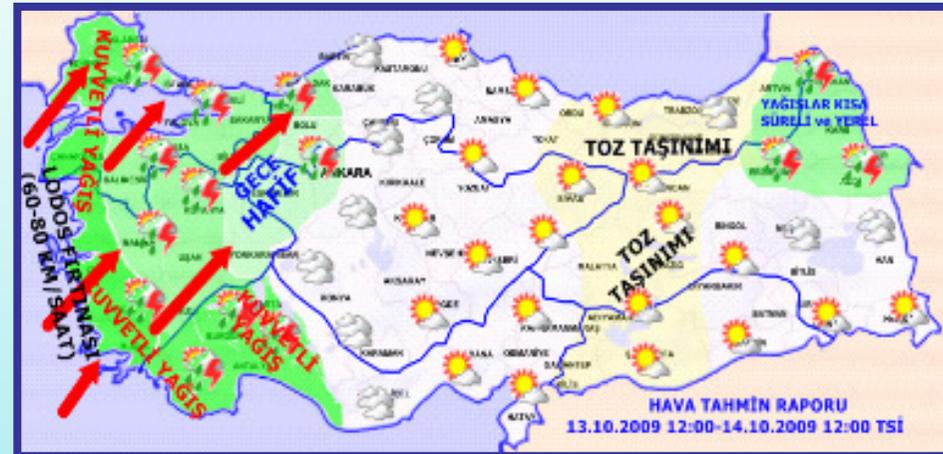
Products & Services

Weather Forecast

Basic Forecasts

Short-Range Forecasts :

- Three updates every day (Morning, noon, evening)
- Daily forecasts of precipitation, temperature and weather condition



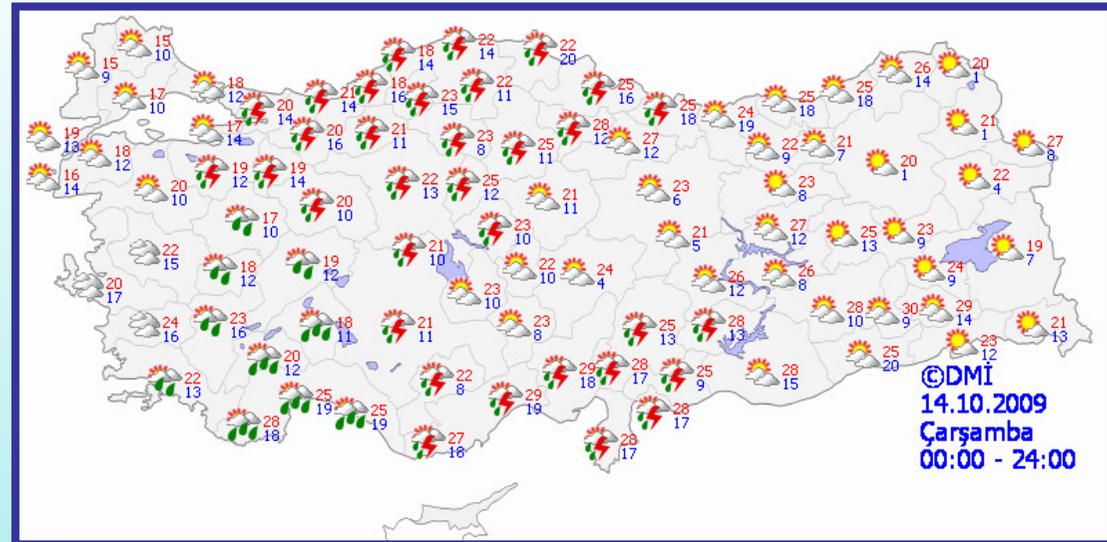
Products & Services

Weather Forecast

Basic Forecasts

Medium-Range Forecasts (Up to 5 days) :

- Updated every day
- Daily forecasts of precipitation, max&min temperatures and weather condition of 81 cities for 5 days



Products & Services

Weather Forecast

Basic Forecasts



Very Short-Range Forecasts and Warnings:

- Forecasts for severe weather
 - Heavy precipitation, thunderstorm, tornado, flood risk
 - Published on WWW, radio, and sent to cell-phones as SMS
 - Precautions managed by the cooperation with Disaster Coordination Centers and local authorities

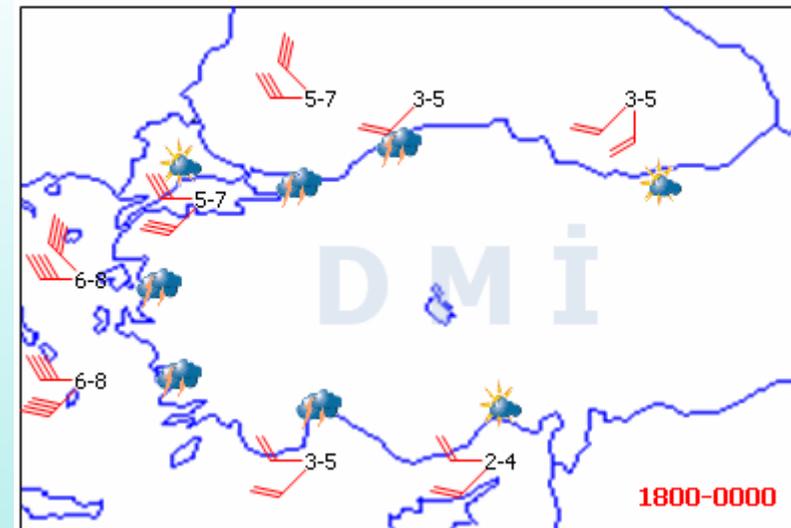
Products & Services

Weather Forecast

Basic Forecasts

Marine Forecasts:

- Daily Reports; wind speed and direction, gale expectation, weather condition, visibility and sea wave
- 3-Days Reports: Maps showing sea forecasts for 3 days



Products & Services

Weather Forecast

Numerical Weather Prediction

Marine Forecasting System

Special web page containing detailed Sea forecasts of seaports, bays and marines of Turkey which are produced by the algorithms combining numerical weather forecasts model and wave model. Serving for yacht tourism, seamen and fishermen.



Products & Services

Weather Forecast

Numerical Weather Prediction

High Performance Super Computer:

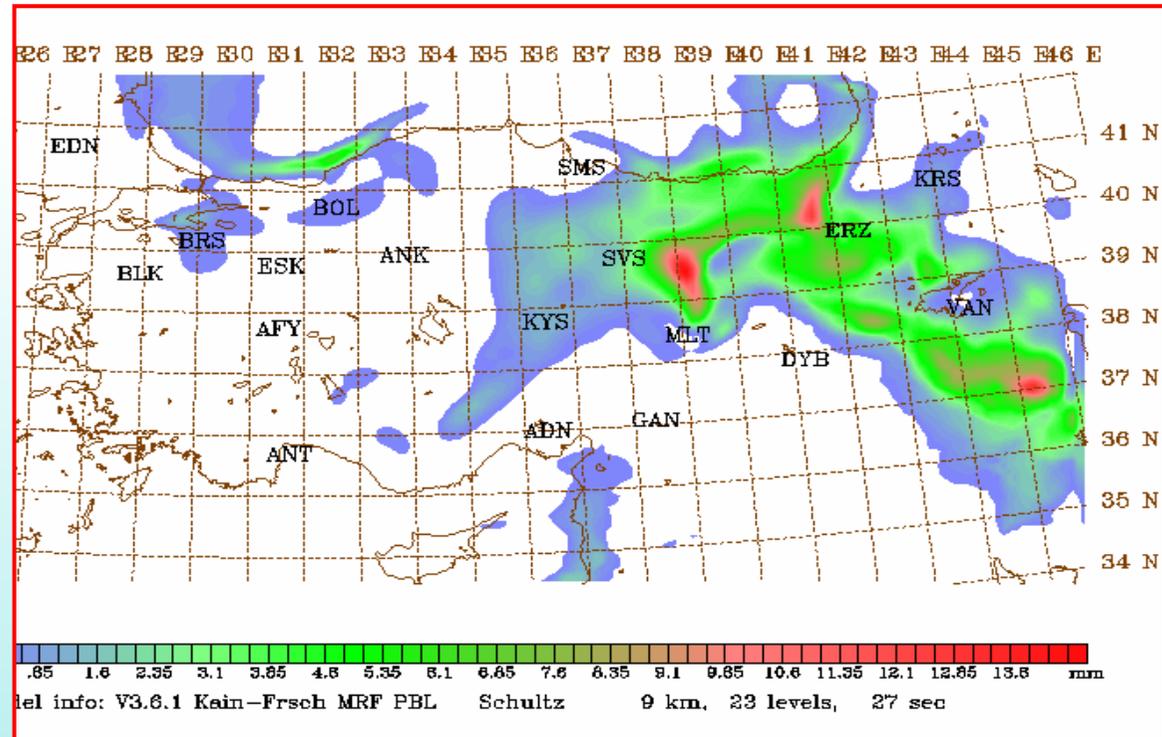
Model: ALTIX 4700

- Number of CPUs: 512
- CPU Speed: 1.6 Ghz
- RAM: 1 TB
- Disk Capacity: 20 TB

Running Models:

- MM5
- METU3
- ALADIN

All set of the products are
accessible on
dmi.gov.tr



Products & Services

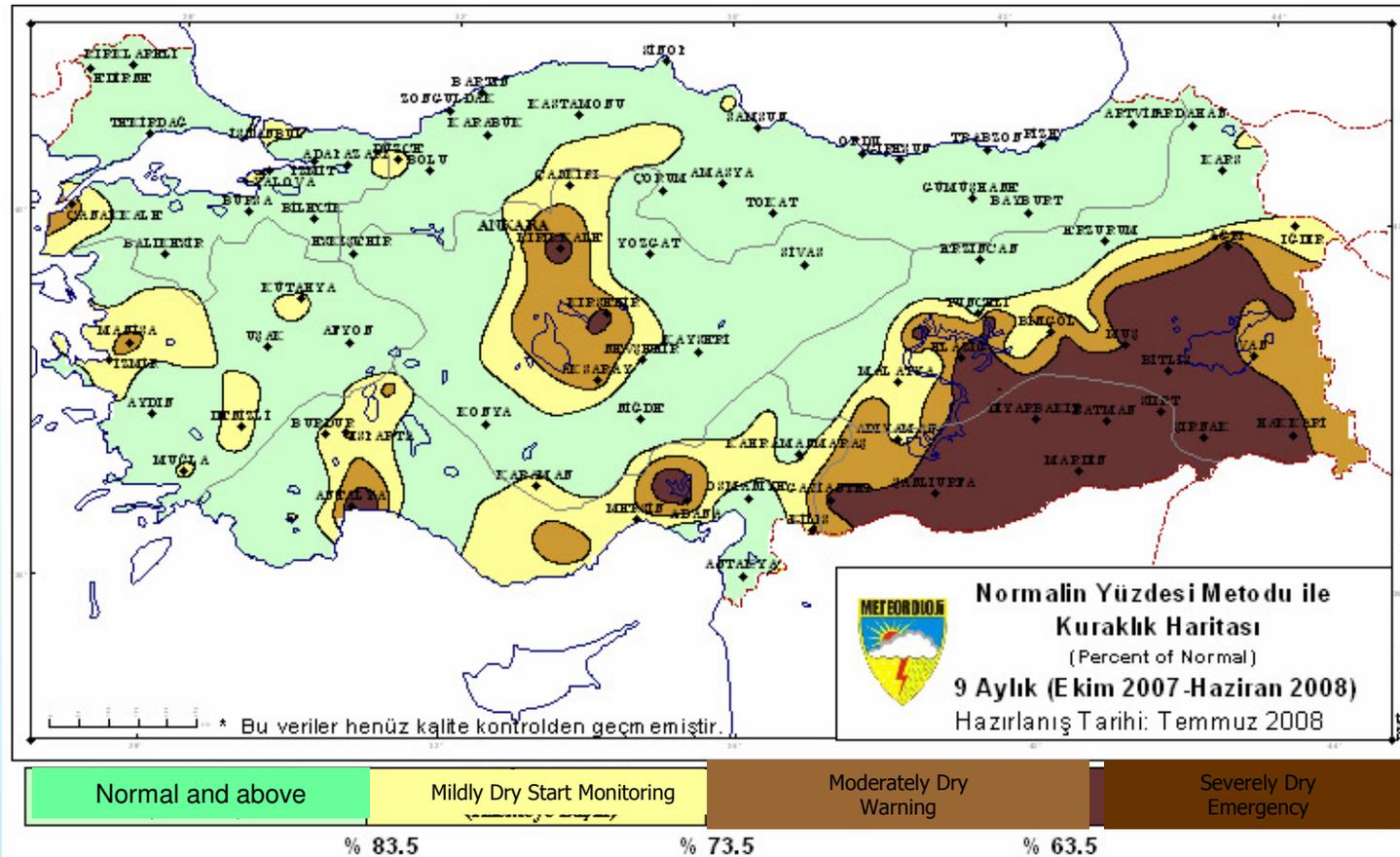
Agrometeorology Analysis of Drought: Indices

Drought Indices used at TSMS in operationally are:

- Standardized Precipitation Index (SPI)
- Percent of Normal
- Aydeniz method
- Palmer Drought Severity Index (PDSI)

Products & Services

Agrometeorology Products Analysis of Drought: Percent of Normal

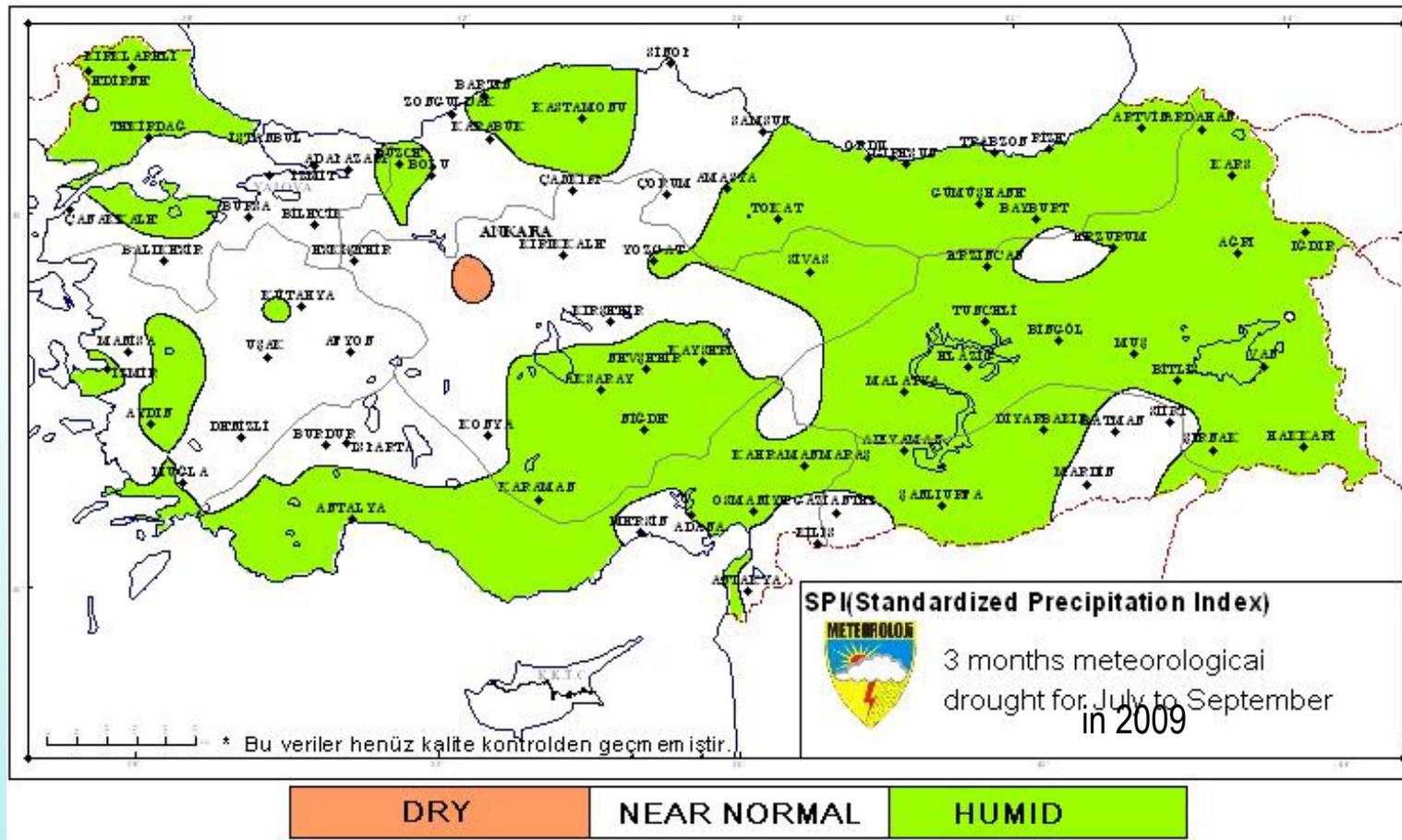


Use of the percent of normal comparison implies a normal distribution where the mean and median are considered to be the same.



Products & Services

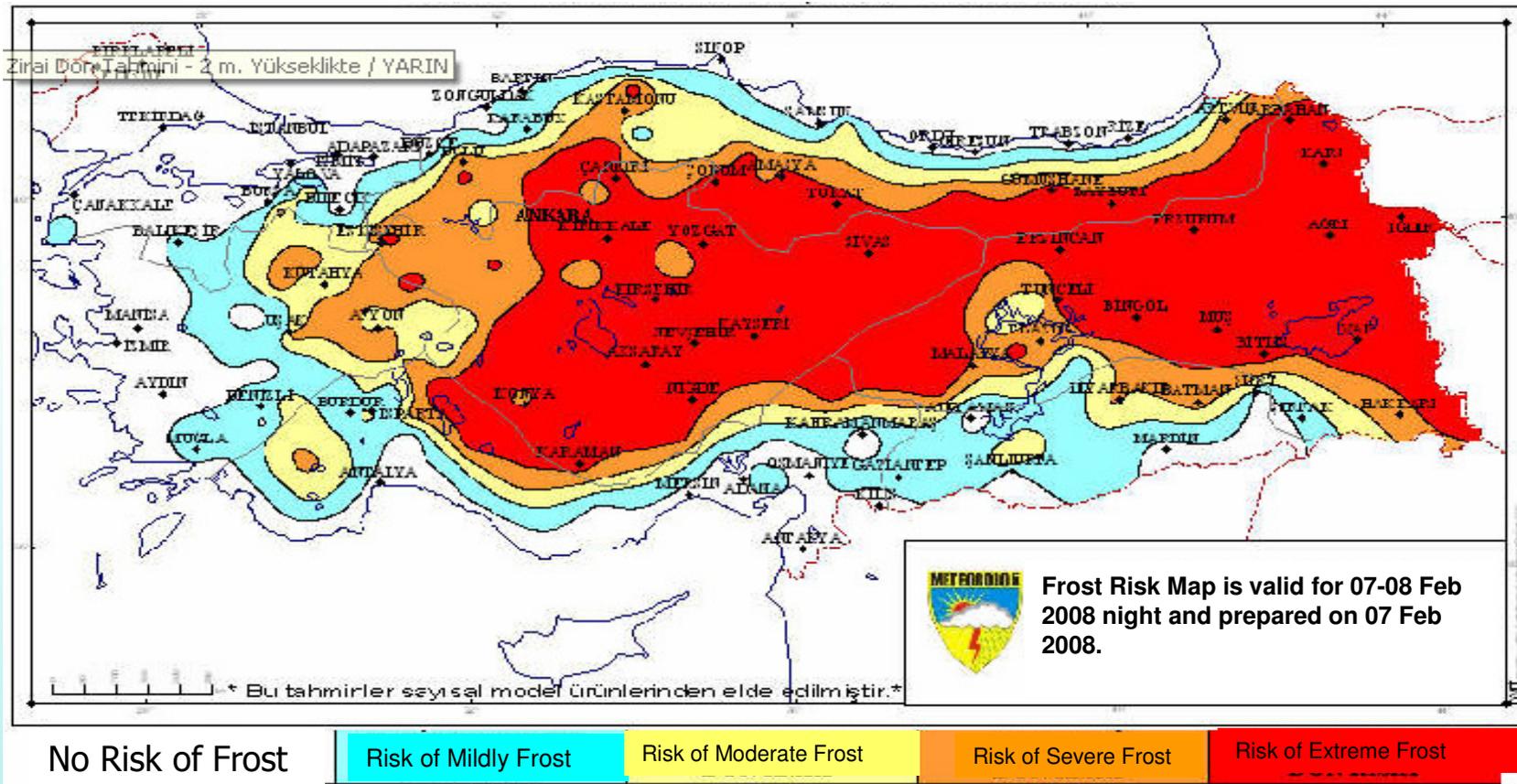
Drought Analysis





Products & Services

Agrometeorology Products: Agricultural Frost Risk Map



Agricultural Frost Risk Maps are prepared and published on web page for 4 days and are updated every day.

Products & Services

AgroMeteorology

Harvest Time Estimates

The “Harvest Time Estimates” prepared in order to find the cumulative temperature degree, that the plants need for growing and developing, and to guess the harvest time by using these merits and to determine the appropriate planting areas of culture plants in our country, is announced through our web site.



The type and the kind of the plant, and the starting time is entered by the user. The minimum, maximum and the total temperature degrees are taken from the database. When you click the “show” button, you see the result as “The harvest time forplant you have chosen is” by calculating the day meeting total temperature requirement of the seed.

Products & Services

AgroMeteorology

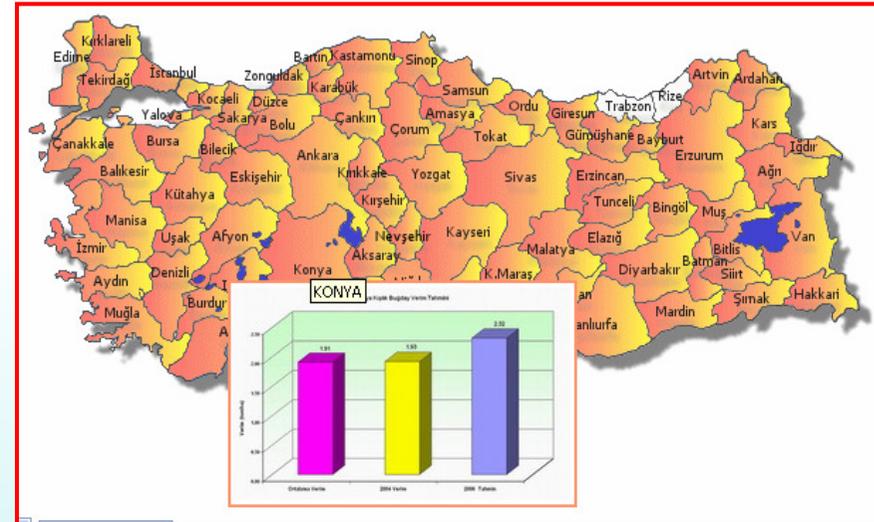
Yield Estimate

Product Tracing and Productivity Estimate

The project has been financed by the FAO (United Nations Food and Agriculture Organization) and realized collectively by TSMS, Ministry of Agriculture and Rural Affairs, TAGEM (General Directorate for Agricultural Research), TİGEM (General Directorate of Agricultural Operations) and TÜİK (Turkish Statistical Institute) .

The product productivity estimates are done by using meteorological data and the Agro meteorological simulation model (AgroMetShellv 1.5) improved by FAO.

The results are announced in our web site as average merits of cities.



Estimated Wheat Crop Yield for the year 2007
(Calculated for every year)

Products & Services

Agrometeorology Products: Agrometeorological Bulletin

- The products which are results of the studies in “Agrometeorology and Climate Observations Directorate” are combined as a monthly bulletin and published on the institutional webpage. (that is www.dmi.gov.tr)
- This bulletin includes precipitation, temperature and drought analysis, extreme events, crop monitoring and yield forecast, and regional reports of agricultural situation.



YAĞIŞ DEĞERLENDİRMESİ

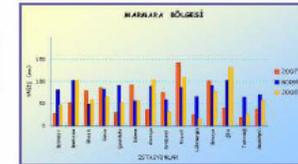
2007 YILI OCAK AYI YAĞIŞ RAPORU

GENEL DURUM : Yağışlar genel olarak normalinden ve geçen yıl Ocak ayı yağışından azalmıştır.

Aylık yağış ortalaması 59,6 mm., normal 84,4 mm., 2006 Ocak ayı ortalaması ise 83,0 mm.dir. Yağışlarda normale göre % 29,4 , geçen yıl Ocak ayına göre de % 28,2 azalmagözlenmiştir.

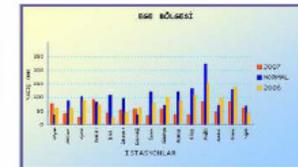
MARMARA BÖLGESİ:

Ocak ayı bölge yağış ortalaması 61 mm., normal 78 mm., 2006 ocak ayı ortalaması ise 67 mm.dir. Yağışlarda normale göre % 22, geçen yıl ocak ayına göre de % 10 azalma gözlenmiştir.



EGE BÖLGESİ:

Ocak ayı bölge yağış ortalaması 56 mm., normal 100 mm., 2006 ocak ayı ortalaması ise 82 mm.dir. Yağışlarda normale göre % 44, geçen yıl ocak ayına göre de % 32 azalma gözlenmiştir.



Public Services

Meteorological Data

Archiving System

The meteorological data that are archived in the database:

- **Climatological Data: from 1926 till now**
- **Synoptic Data: For International Stations - from 1980 till now**
- **For National Stations - from 2004 till now**
- **Radiosonde (Upper Air) Data: from 1971 till now**
- **Aviation Data (Metar): from 2000 till now**
- **TAF Data: from 2008/03 till now**
- **SIGMET Data: from 2008/03 till now**
- **AIRMET Data: from 2008/03 till now**
- **GAMET Data: from 2008/03 till now**
- **Ozone Data: from 1994 till now**
- **Inversion Forecast : from 2005 till now**
- **Rain Water Analysis Data: from 1999 till now**
- **UV - B Data: from 1997 till now**

Meteorological Data are archived in informix and sybase databases on the Unix&Linux platform. The size of the meteorological data is 150 GB.

Public Services

Training & Capacity Building



WORLD METEOROLOGICAL ORGANIZATION
REGIONAL TRAINING CENTRE
Turkey

Facilities Courses Training Packages Training Documents Announcements News Links

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07.13.2009
Monday

Alanya Facility

19 August 2009, Wednesday, 11:23 Local | 19 August 2009, Wednesday, 08:23 UTC

GO Turkey.com TSMS WMO ECMWF EUMETSAT ECOMET

Main Page | XXXXXXXX

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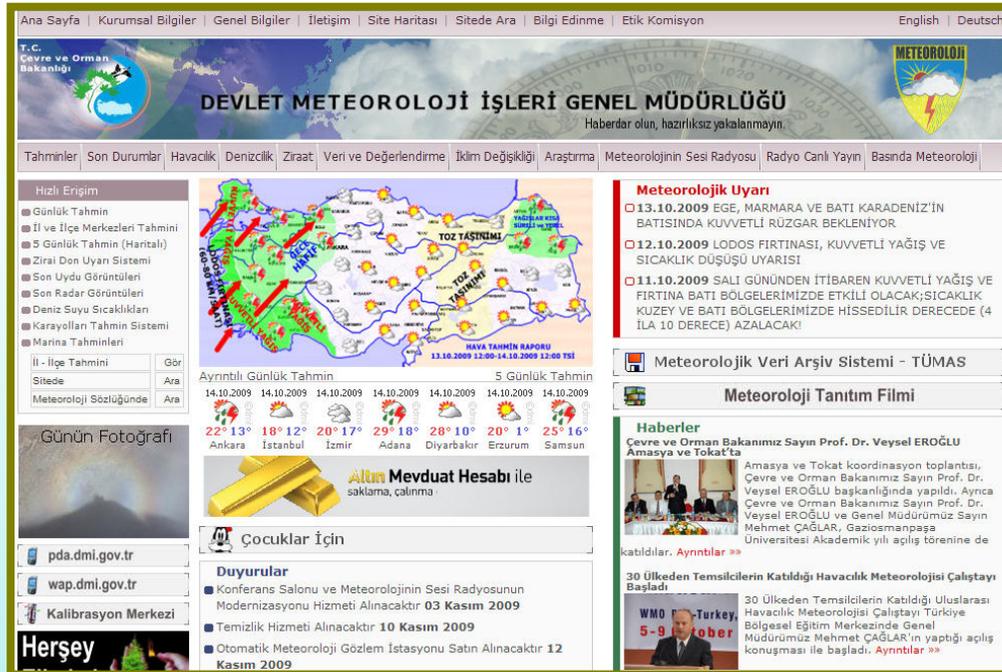
More than 300 participants have been trained in WMO RTC in Alanya Facilities on Climate Indices, Regional Climate Models (PRECIS, RegCM3), AWOS, Telecommunications, Agricultural Meteorology, etc

Public Services

Internet

www.dmi.gov.tr

TSMS WEB site dmi.gov.tr is very popular among the country, reaching **2.000.000** visits per day. It has a limited content in English and German.



The screenshot shows the homepage of the Turkish State Meteorological Service (DGM) website. The header includes the Ministry of Environment and Forestry logo and the text "DEVLET METEOROLOJİ İŞLERİ GENEL MÜDÜRLÜĞÜ". Below the header is a navigation menu with various service categories. The main content area features a weather map of Turkey with a "TOZ TAŞINIMI" (Dust Transport) alert. A "Meteorolojik Uyarı" (Meteorological Warning) section lists recent events, including a strong wind warning for the Marmara and Aegean regions. The website also displays a "Günün Fotoğrafı" (Today's Photo) and a "Çocuklar İçin" (For Children) section. The footer contains contact information and a "Herşey" (Everything) link.

- Special award of jury in a private web-site competition.
- Update frequency: 10 minutes.
- Offers a rich content.
- Internet connection speed: 100 Mbytes with the "Metro Ethernet" connection that is used in only a few public establishments.

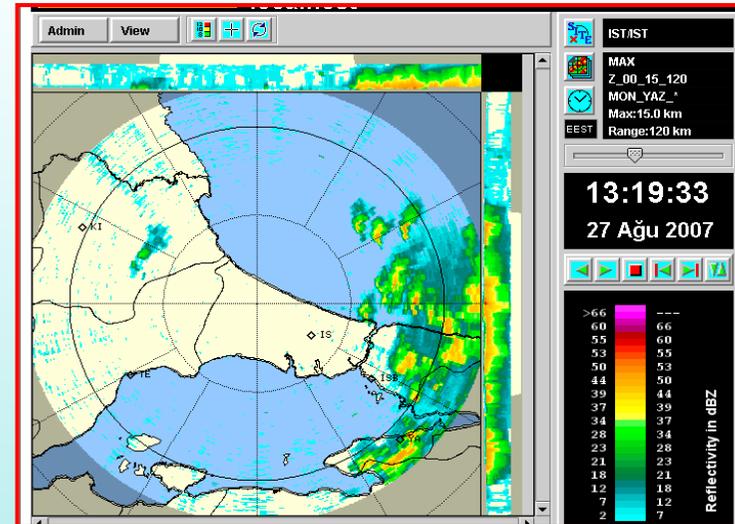
Public Services

MMS and E-mail Services

Meteorological Warnings



To prevent and mitigate the human and property losses in severe weather events, Early Warnings are prepared and sent to Public via GSM Operators (MMS) and e-mail.



Public Services

FM Radio

Meteorolojinin Sesi



Our Radio Channel ("Meteor FM") broadcasts in **20** different **cities** and reaching almost **40 million** people country-wide. Our broadcast is accessible all over the world via Turksat 1-C satellite.

Preparations to extent the broadcast to **6 more cities** are underway.

Research & Project

Research Topics

RESEARCH ACTIVITIES - Working Topics

- Climate change and Variety
- Air Pollution and Acid Rains
- Natural Disasters, Drought and Desertification
- Ozon/UV-B Observing and Research
- Weather Modification
- Forest Fires
- Renewable Energy Sources
- Biometeorology

Research & Project

Air Pollution and Acidrains

- Acidrain Studies: Rain samples of Çamkoru, Balıkesir, Çatalca, Antalya and Amasra Rain Gauge Stations are being analyzed constantly.
- Air Pollution Studies: Air Quality Forecasts of EURAD Model developed by University of Cologne-Germany are prepared and published for testing purpose.
- Pollution Dispersion and Forward Trajectories for selected locations are prepared by HYSPLIT Model developed by US NOAA.
- Studies of "Inversion Risk Prediction Model for Urban Air Pollution" developed by TSMS are being carried on and the results are published on web site:

<http://www.dmi.gov.tr/arastirma/hava-kirliligi.aspx>

Research & Project

Various Studies

Natural Disasters, Drought and Desertification Studies

- As a member of "**Drought Management Center for Southeastern Europe**" (Hosting country : Slovenia; Started in 2007) TSMS contributes the studies enforced by "United Nations Convention to Combat Desertification"
- **SPI Drought Index Forecast Model** has been developed and it operates. Georgian Meteorological Service requested for the model to be installed for them.
- With the scope of a project supported by Agricultural Ministry, studies of "**Palmer Drought Strength Index**" are being carried out.

Research & Project

Forest Fires

- “Early Warning Model for Forest Fires” was developed and results of the model are given to Forestry Organization Forest Fires Operations Center. Verification studies are being carried on for the year 2007 with the actual forest fires data.
- “Analysis of Large Forest Fires with Meteorological Data” project has been accomplished.
- Studies on “Impacts of Air Masses Effecting Turkey on Forest Fires” are being carried on.



Research & Project

Ozone/UV-B

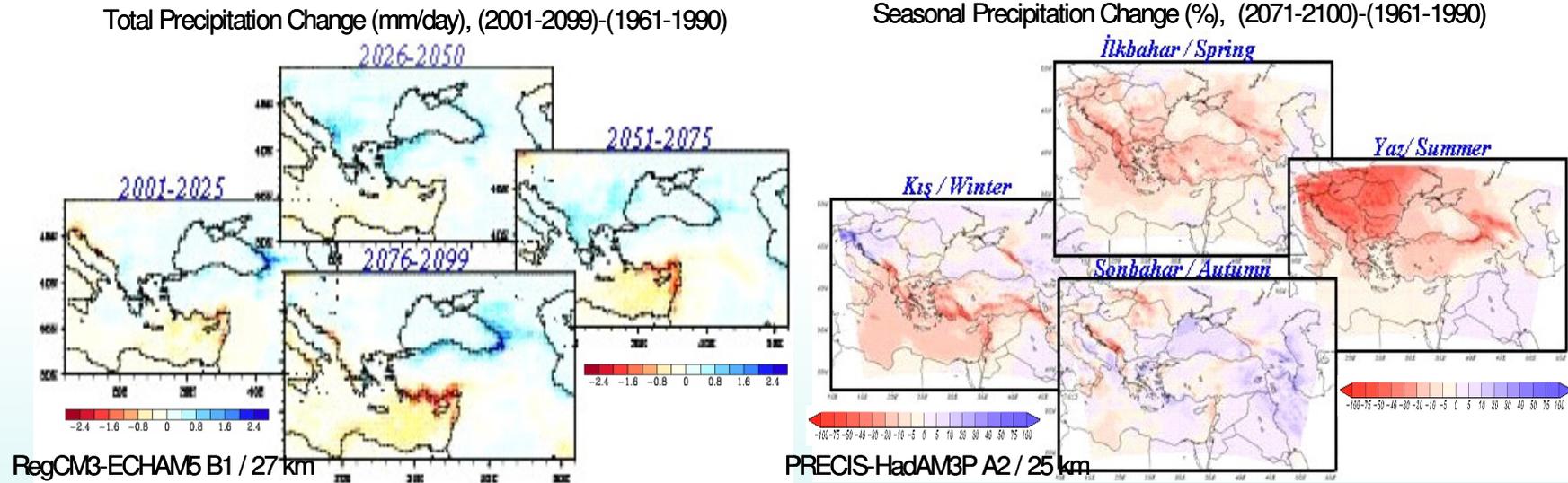
Ozon/UV-B Observations and Research

- Project on "Observing Tropospheric and Stratospheric Ozone/UV-B Variation and Analysis of the Results" has been accomplished.
- Observations of Ozone and UV radiation with Brewer Spektrophotometer are continuing.
- Formulations derived for Ozone and UV Index Forecasting of Ankara were used in a software programme as a part of ongoing experimental project.
- Ozone measurement with Ozonesonde Method is done once in two-week period and UV-B Radiation measurement with UV Biometer Device is done with an half-hour period in Ankara.



Climate

Regional Climate Model Studies



Two different regional climate models have been run to obtain possible changes in future climate of Turkey. These are, **RegCM3** of the International Centre for Theoretical Physics (ICTP) and **PRECIS** of Hadley Centre of the UK Met Office.

As a result of model runs, it is aimed to generate climate change projections and scenarios for Turkey by using different global model outputs based on greenhouse gas emissions scenarios varying according to economical and technological developments of communities in the world.

Climate

Regional Climate Model (RegCM3) Outputs - Temperature

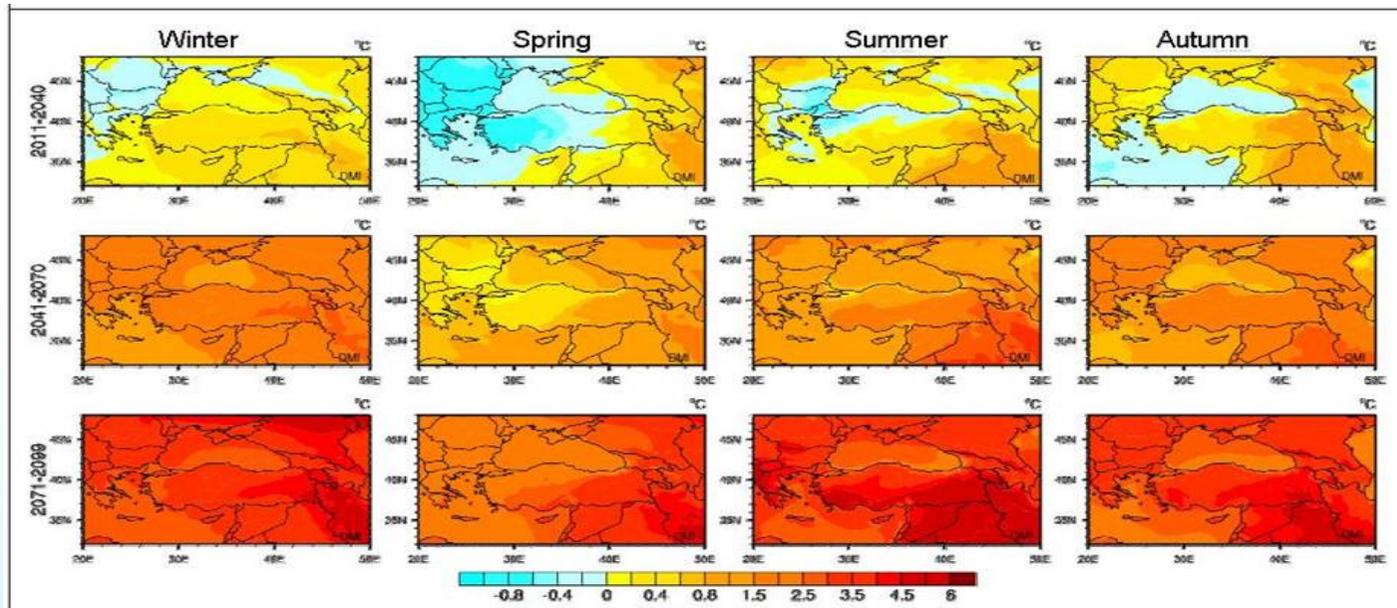


Fig. Turkey expected seasonal temperature changes by the regional climate model (RegCM3) outputs. (Scenario A2, initial condition from ECHAM5, base period: 1961-1990)

Winter and spring temperature slightly decrease (0.5 °C) over the Balkans and northern parts of region for the first 30 year.

Temperature is significantly increase (3-4 °C) especially in Mediterranean region, eastern and southeastern regions of Turkey between 2071-2099.

Climate

Regional Climate Model (RegCM3) Outputs - Precipitation

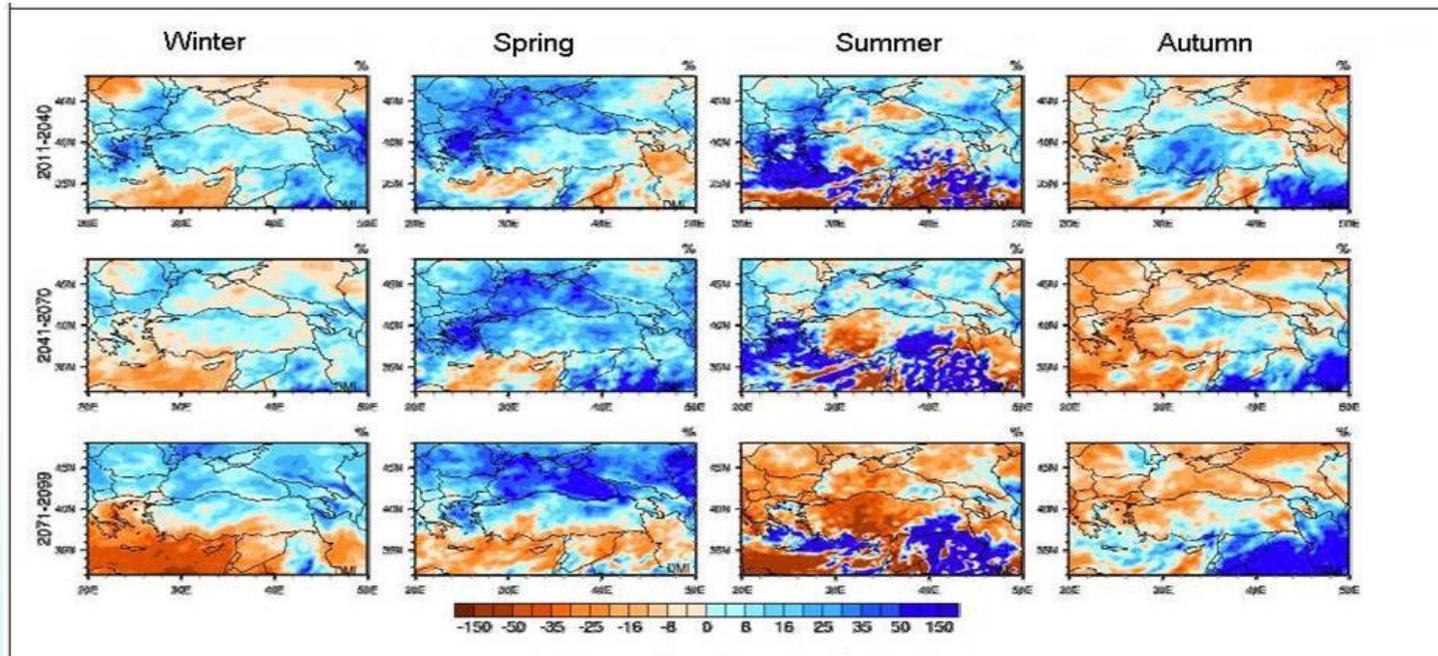
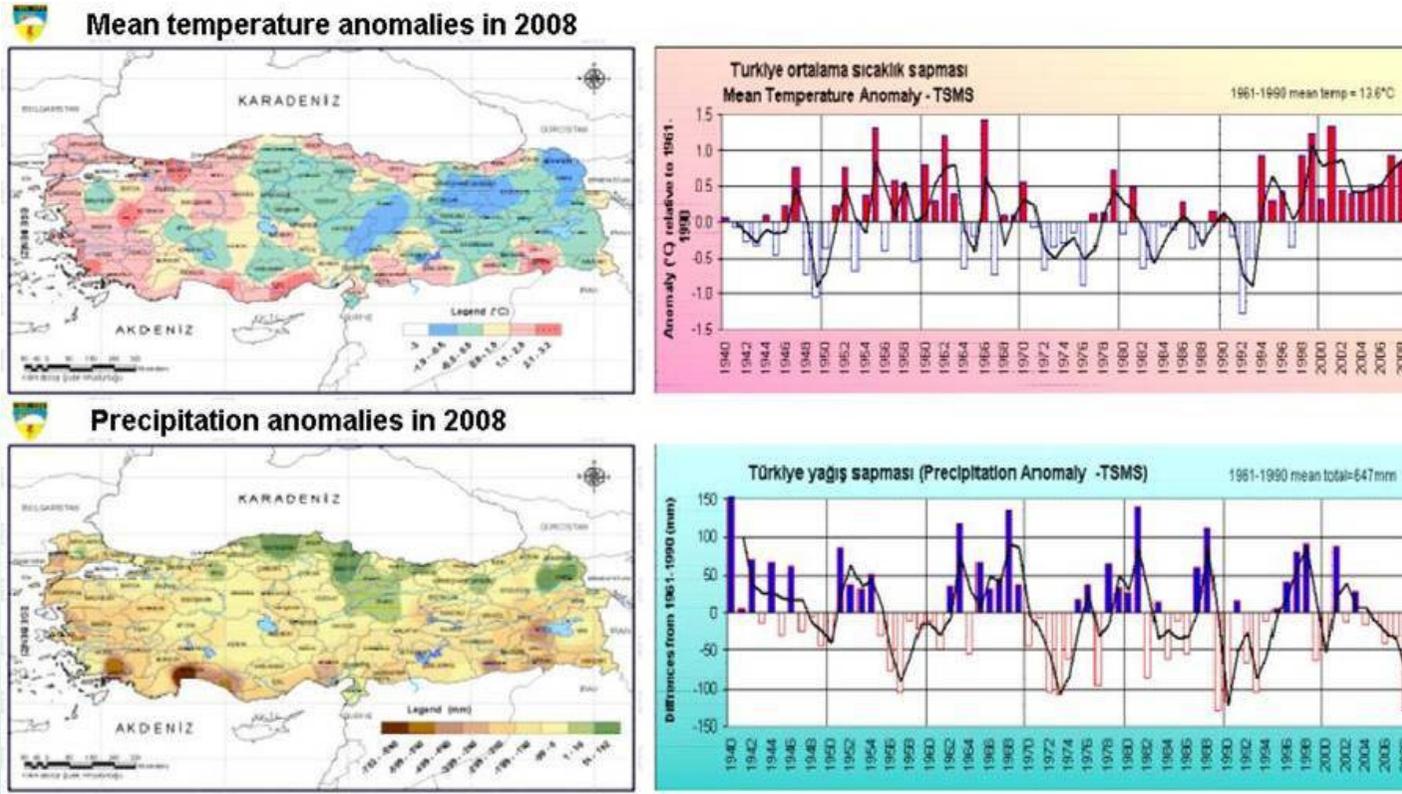


Fig. Turkey expected precipitation changes (%) by the regional climate model (RegCM3) outputs. (Scenario A2, initial condition from ECHAM5, base period: 1961-1990)

For the first 30 year precipitation is projected to increase over Turkey and its region. Winter precipitation dramatically decrease (%10-30) in south part of Turkey and increase (%10-25) in the north for the period of 2071-2099.

Climate

Annual climate assessment



2008 mean temperature was 0.8°C above the 1961-1990 average (13.6°C). Generally coastal area and western part of the country had temperatures above the mean while around Sivas, Erzurum and Kars had below it. Positive temperature anomalies have been occurred since 1994 (except 1997) (Fig. 1). Our services has been contributed to the “Statement on the Status of the Climate ” which published by NOAA, BAMS and WMO.

Climate

WMO VI. Region (EMCC) Eastern Mediterranean Climate Center Studies

TSMS has taken initiative at the meeting of Implementation of RA VI RCC Network held on 20-21 October, 2008 in Geneva, Switzerland in order to carry out the following responsibilities:

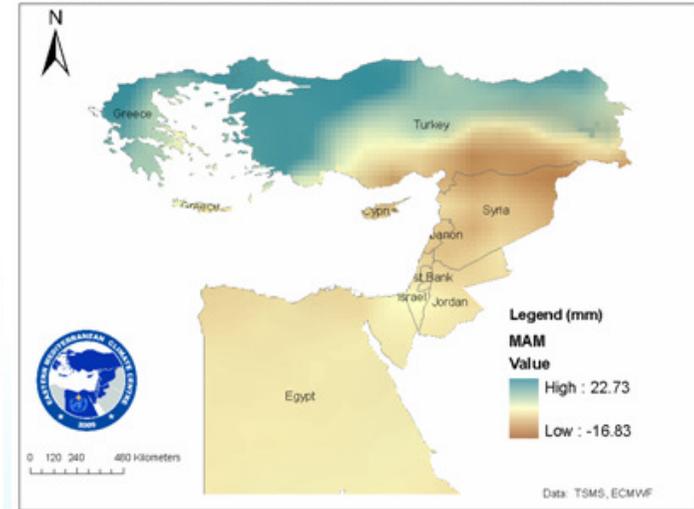
1. TT(2m temperature) ve RR (rain rate) monitoring
2. Seasonal temperature and precipitation prediction maps
3. Data Service

Web site: <http://emcc.dmi.gov.tr/>

Climate

<http://emcc.dmi.gov.tr/>

Seasonal Forecast
Precipitation rate anomaly for The Eastern Mediterranean Region in MAM 2009



Seasonal Forecast is updated every month for the next 3 month and contains precipitation rate anomaly and 2m temperature anomaly maps which is drawing from ECMWF seasonal forecast data for the EMCC region.

Monitoring data is prepared from combined Turkish State Meteorological Service (station data) and NCEP (reanalysis, grid) data. This part is updated every end of month for pervious month.



**On behalf of my Service,
thank you
for your attention...**