Weather for balloonists

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Understanding the lower atmosphere
WHICH ONE HAS THE HIGHEST SURFACE PRESSURE?
OKAY, THEN…

DOES THE TEMPERATURE OF THE AIR MASS DETERMINES THE SURFACE PRESSURE?

YES

AS TEMPERATURE INCREASES (DECREASES), AIR EXPANDS (COMPRESSES) SO THAT THERE ARE FEWER (MORE) MOLECULES IN A UNIT VOLUME. AS A CONSEQUENCE, THE PRESSURE DECREASES (INCREASES)!!
AND NO!

THERE ARE OTHER WAYS TO CREATE PRESSURE DIFFERENCES.

DIVERGENCE

CONVERGENCE

Air is **removed** from the column by **low level CON** and **upper level DIV**.

SURFACE LOW

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Air is **added** to the column by **low level DIV**, **upper level CON**.

SURFACE HIGH
THERMAL STABILITY/INSTABILITY

ALTITUDE

TEMPERATURE

10 C/km

STABLE

UNSTABLE
GSO
BOUNDARY LAYER EVOLUTION

Entrainment Zone

Residual Layer

Nighttime Stable Layer

Daytime Convective Mixed Layer

Stable Layer

SR NOON SS

BL Clouds
Morning
Evening
Circulations

Courtesy, N. Seamans, PSU
The Case Study of 15-19 July 1999
Evidence of LLJs

Philadelphia Air Monitoring
Date: 7/16/1999

Philadelphia Air Monitoring
Date: 7/17/1999

Philadelphia Air Monitoring
Date: 7/18/1999

Philadelphia Air Monitoring
Date: 7/19/1999
Aircraft vertical profiles for 19 JUL 96, 20:08 CDT

**U, V velocity components**

**Energy Dissipation Rate**

**Potential Temperature**

**Mixing Ratio**
Aircraft vertical profiles for 19 JUL 96, 23:48 CDT
Aircraft vertical profiles for 20 JUL 96, 01:54 CDT
Aircraft vertical profiles for 20 JUL 96, 05:51:30 CDT

U, V velocity components

Energy Dissipation Rate

Potential Temperature

Mixing Ratio
MOUNTAIN-VALLEY CIRCULATION
Mountain Breeze
MOUNTAIN-VALLEY CIRCULATION
Valley Breeze
Sea Breeze Convergence Zones
Water Vapor Mixing Ratio - 07/31/99 18:00 - 23:59 UTC

- 1549 EDT
- 1949 UTC
- 1647 EDT
- 2047 UTC

PSU Raman Lidar
Vertical profiles prior to passage of sea/bay breeze convergence zone

1549 EDT 31 July 1999
Vertical Profiles after the passage of the sea/bay breeze front
1647 EDT 31 July 1999
WIND SHEAR ON THE DOWNWIND SIDE

Most frequent under clear skies around sunset

Surprise!
WATCH THE CLOUDS.
Microbursts
WATCH THE CLOUDS

BACKING

VEERING

CAA

WAA
WEB SITES

http://nws.noaa.gov

http://www.atmos.millersville.edu
THERE IS A PLETHORA OF OBSERVATIONS AND MODEL FORECASTS AVAILABLE ON THE INTERNET.

www.nws.noaa.gov

From this web site you can access any product made available from the National Weather Service.

* Aviation forecasts (terminal forecasts)
* Current observations
* Eta, NGM, AVN, MRF, and ECWCF model forecasts.
* NGM and AVN MOS Numerical Guidance.
* And much, much more.
Model Cross-sections
http://www.ems.psu.edu/~bryan/mm5/meteograms.html
The end