

Air Masses & Fronts

- An **air mass** is large body of air whose temperature and moisture is similar at a given height [p. 302/314/286]
 - an air mass may cover thousands of square km
- Air masses originate in **source regions** that are large and fairly uniform

Cults station, before the Beeching axe →

• Sources are **Polar (P), Tropical (T), maritime (m) or continental (c)**

- mP, moist and cold
- mT, moist and warm
- cP, dry and cold
- cT, dry and warm



General Air Mass Features

- Air mass colder than underlying surface
 - warming from below
 - increased low level lapse rate
 -  **atmospheric instability**
 - increased convection and mixing near ground
 - good visibility, cumulus clouds, showers



- Air mass warmer than underlying surface
 - cooling from below
 - reduced low level lapse rate
 -  **atmospheric stability**
 - little vertical mixing
 - accumulation of dust & smoke, restricting visibility
 - stratiform clouds, drizzle or fog

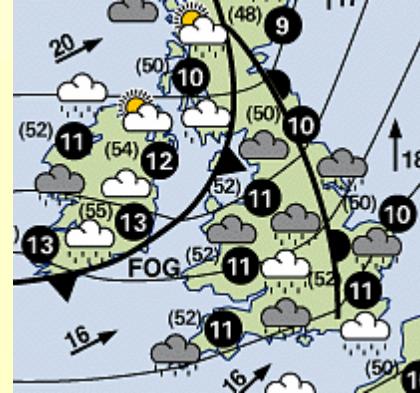
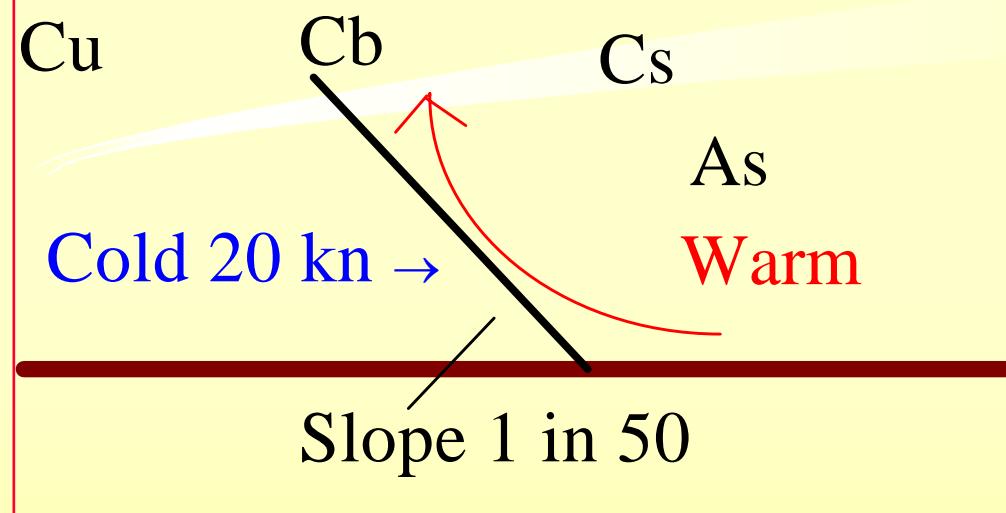
Fronts

- A Front is the transition zone between air masses of different characteristics
- Fronts are recognizable by:
 - sharp change in temperature
 - shift in wind direction
 - change in clouds
 - change in moisture content (dew point)
 - direction change of isobars
- Fronts are named after the kind of air that follows



Fronts over the Findon coast

Cold Front Passing



- Winds [table 12.2/11.2]
 - SW → W - NW (veering)
- Temperature
 - sharp fall → falling
- Pressure
 - steady fall → steady rise

Clouds

- e.g. Ci, Cs + As → Cb
→ Cu

Precipitation

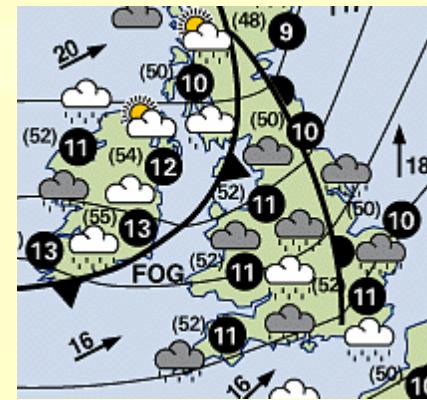
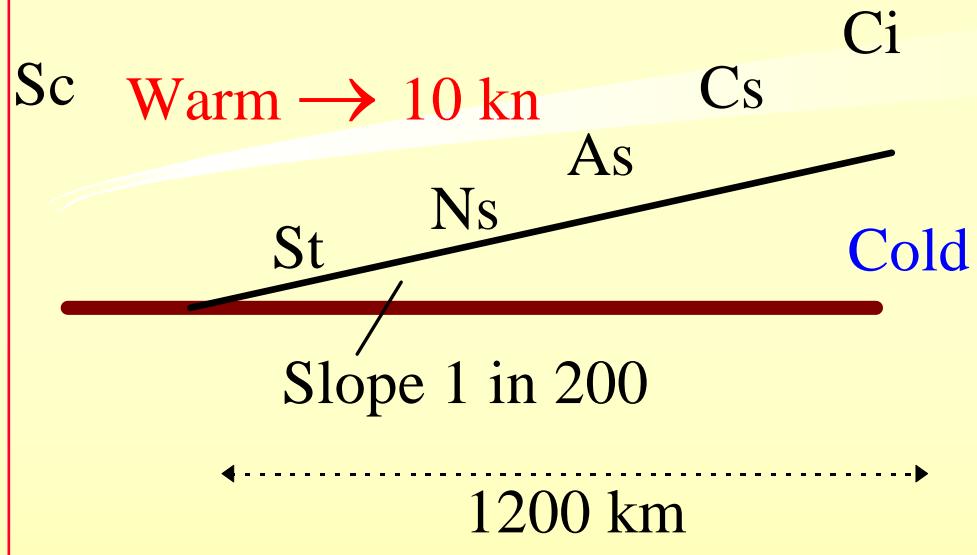
- showers → clearing

Visibility

- fair → good

Dew point

- high → lowering



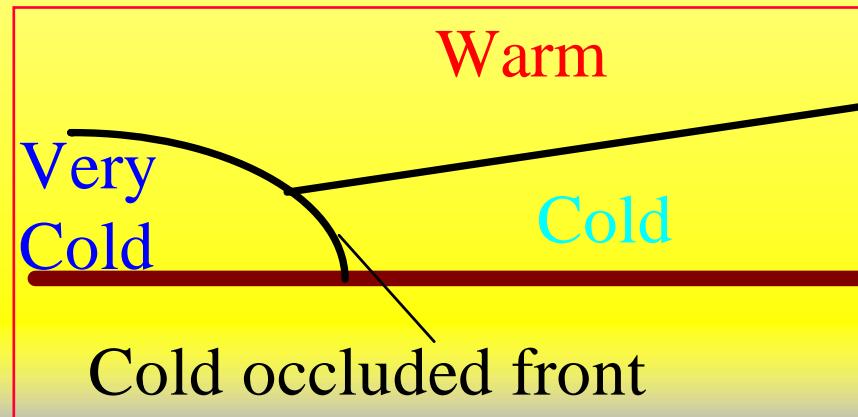
Warm Front Passing

- Winds [table 12.3/11.3]
 - SE → SW
- Temperature
 - slow warming → warmer then steady
- Pressure
 - usually falling → levelling → (falling)

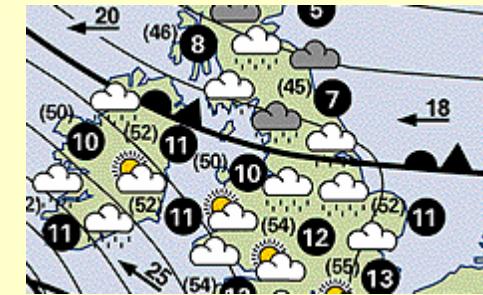
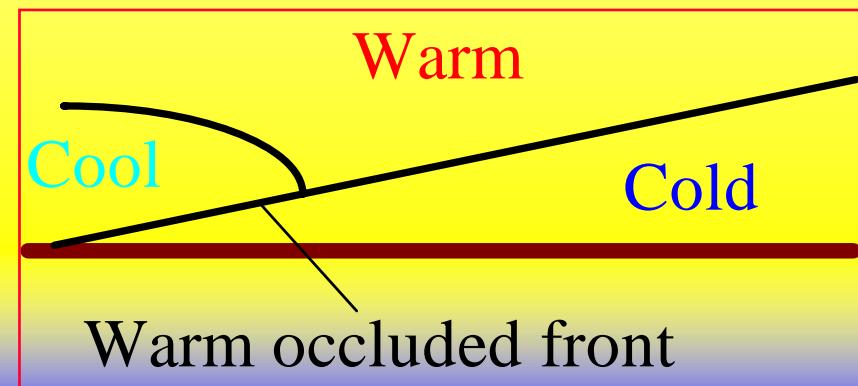
- Clouds
 - Ci → Cs → As → Ns → St → clearing Sc
- Precipitation
 - moderate rain → light rain or clearing
- Visibility
 - poor → fair
- Dew point
 - rise → rise

Occluded Fronts

- Cold occluded front
 - very cold front overtakes a warm front
 - weather begins like a warm front and ends like a cold front
 - surface front precedes upper level front



- Warm occluded front
 - cool front overtakes a warm front overlying a cold front [p 320/332/302]
 - weather similar to a warm front
 - surface front trails upper level front by ~300 km



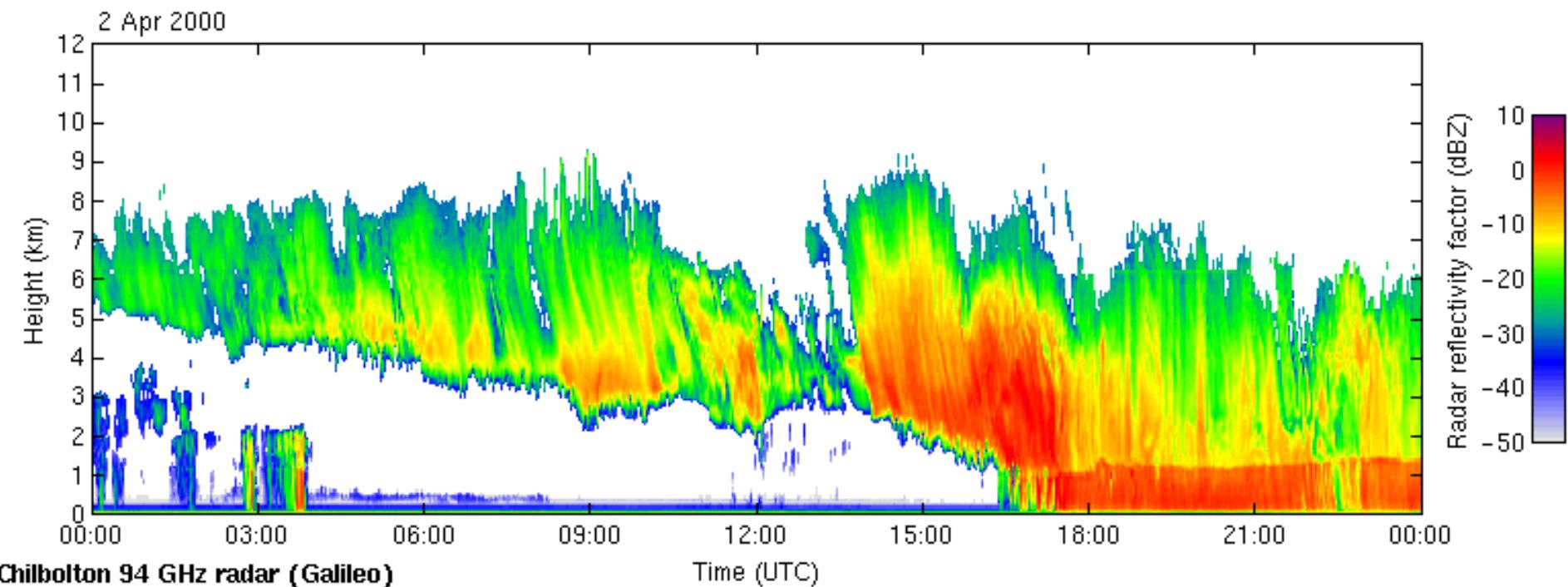


A Warm Occluded Front

- The front approaches ↑ high elevation Ci; near the horizon Ci, Cs and Ac
- Right: front arrives, St and Ns with continuous rain →



Cloud Height Plot of an Approaching Warm Front



- Cloud height determined by upward-pointing rain radar technique

Example Lows and Clouds

- ✿ Satellite picture showing clouds accompanying 3 adjacent depressions

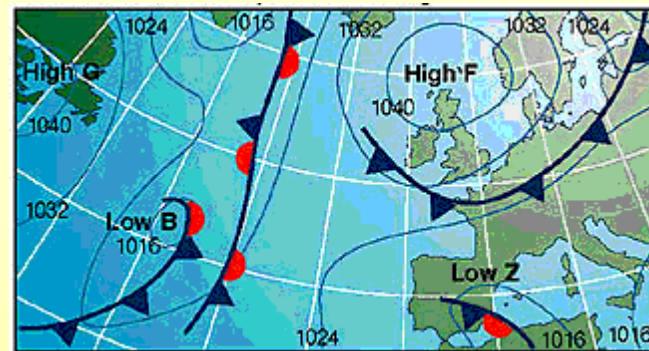


Important summary

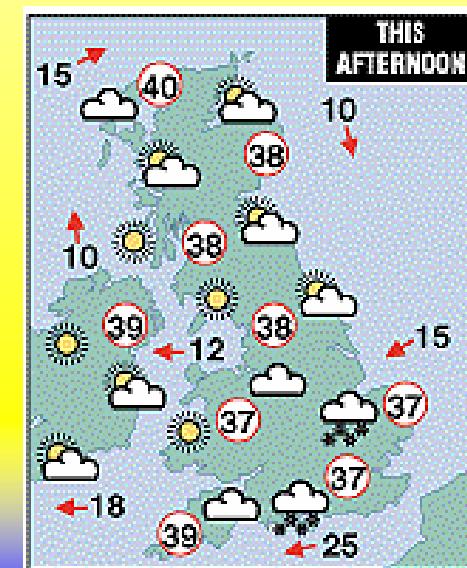
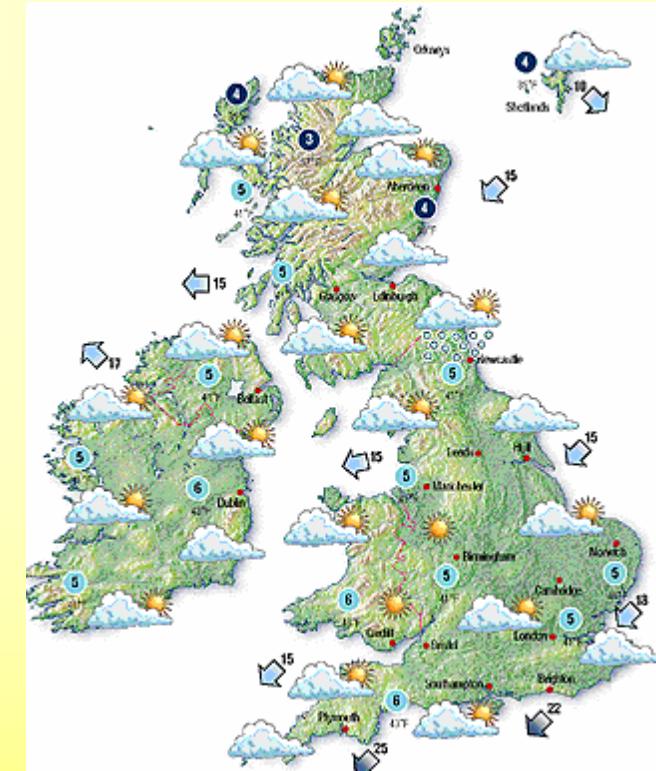
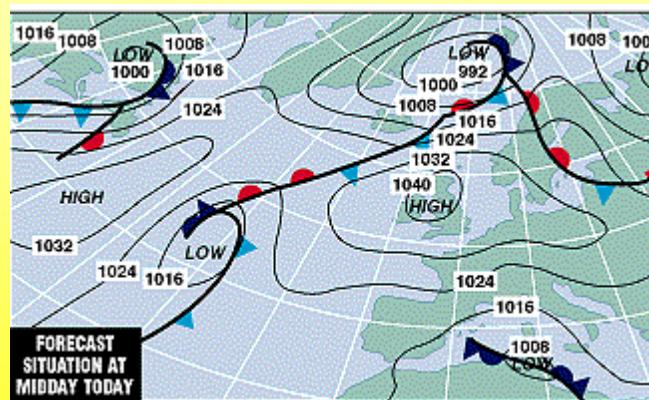
- ◆ The weather system does not generally move in the direction of the local wind
 - the weather system follows its own track over the Earth's surface, determined by factors mentioned in the final chapter of this course

Winter High

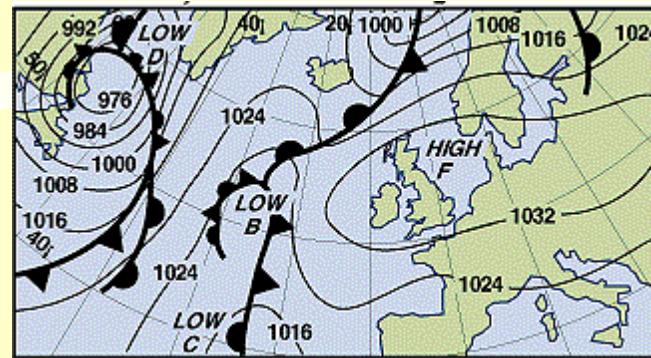
- Day 1:
sunshine
and light
winds



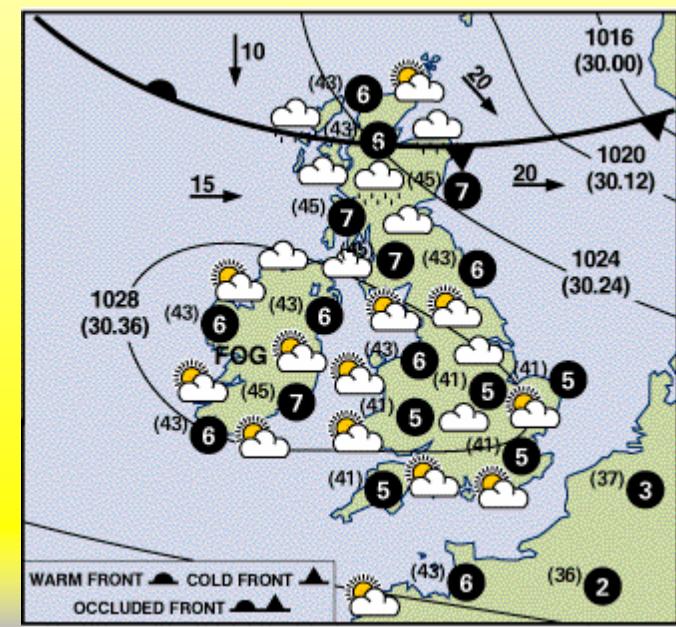
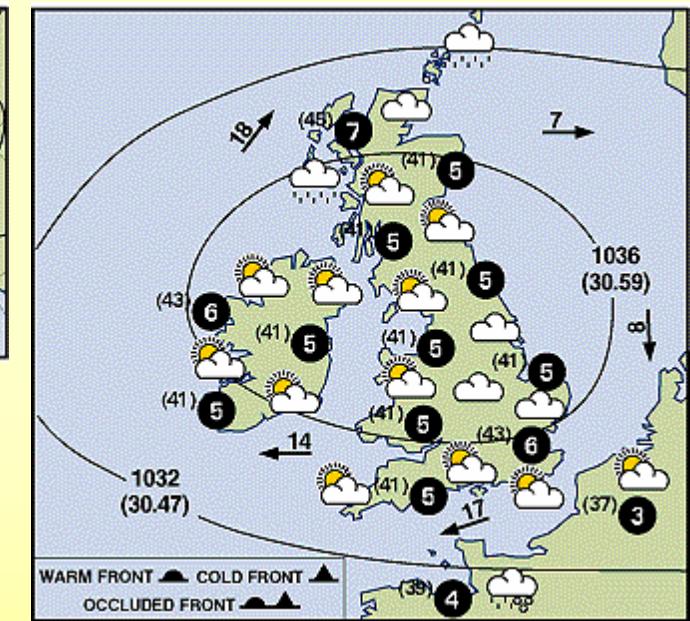
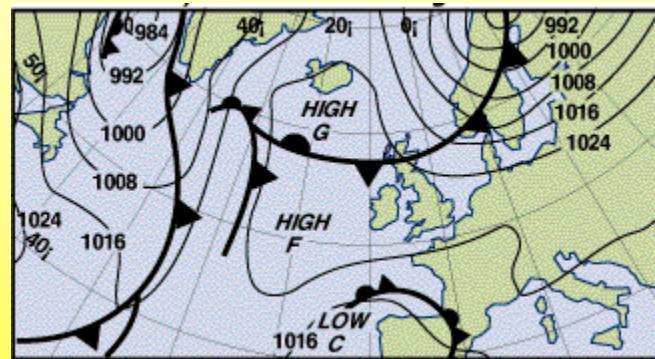
- Day 2:
Polar low
develops
to North;
freshening Easterlies in
South bring cP air and
some snow



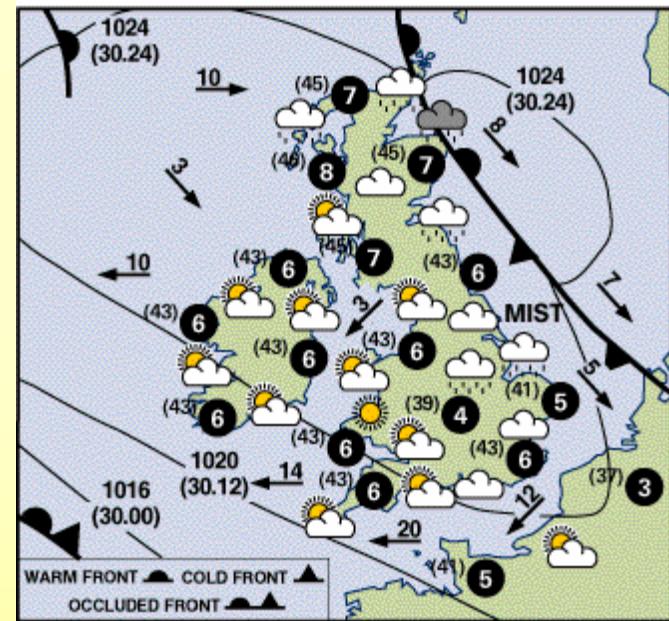
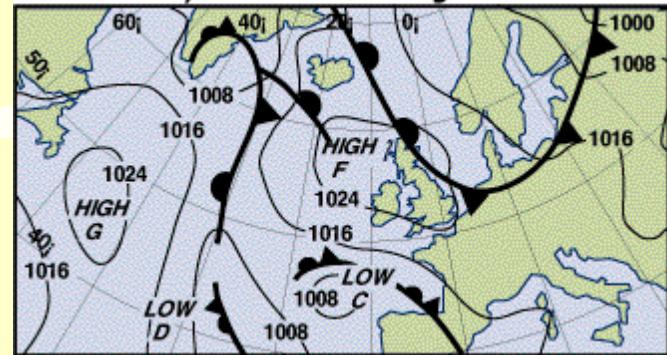
• Day 3:
some cloud,
cool but not
cold, light anti-cyclonic winds



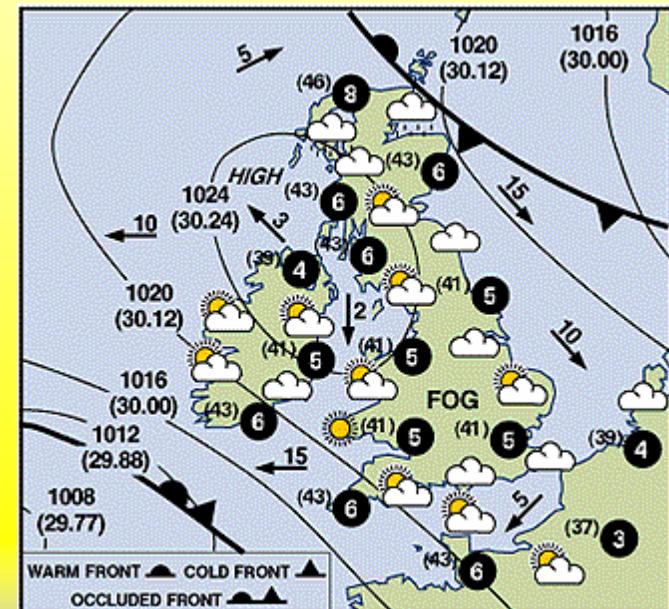
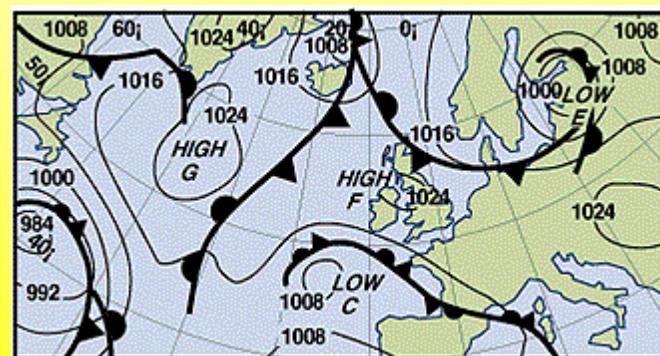
• Day 4:
residue of
polar low
brings
brisker N winds and cloud to N
Scotland; elsewhere very light
winds in weak pressure gradient



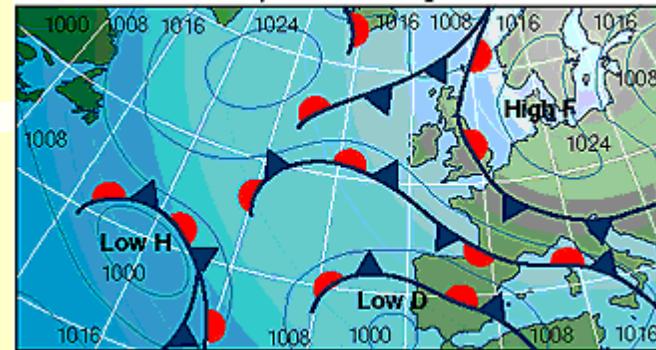
- Day 6:
(only modest change on day 5); warm front over NE Scotland brings cloud and some rain



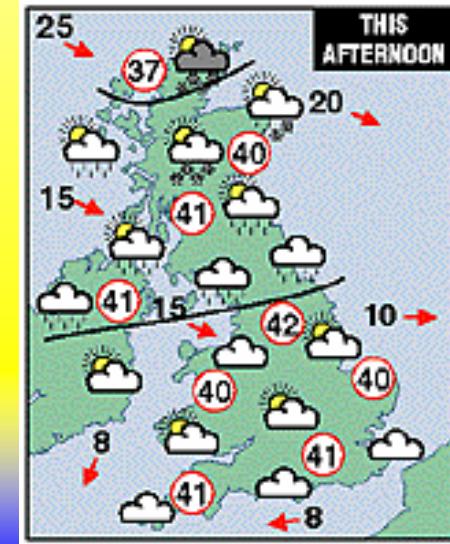
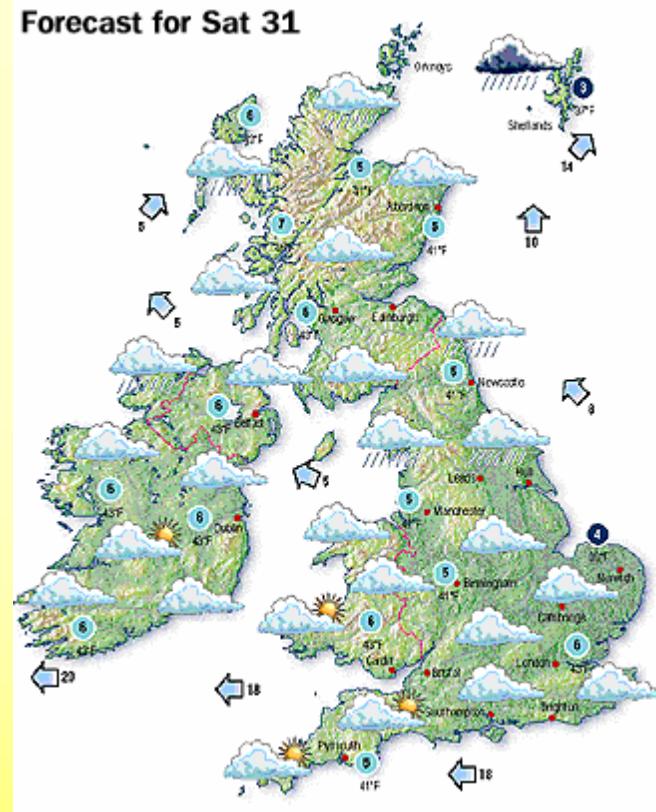
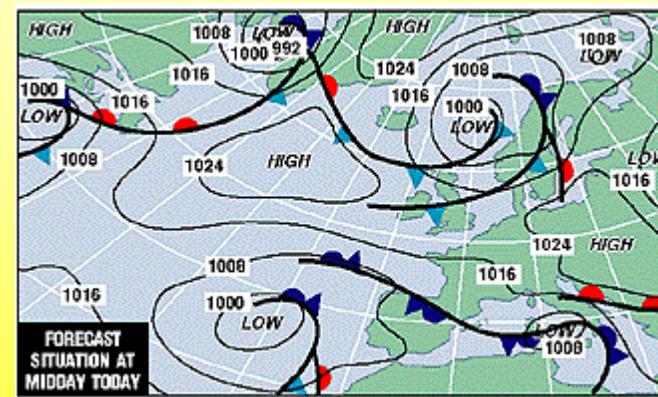
- Day 7:
fronts develop around high; warm front makes NW Scotland warmest and wettest part of country



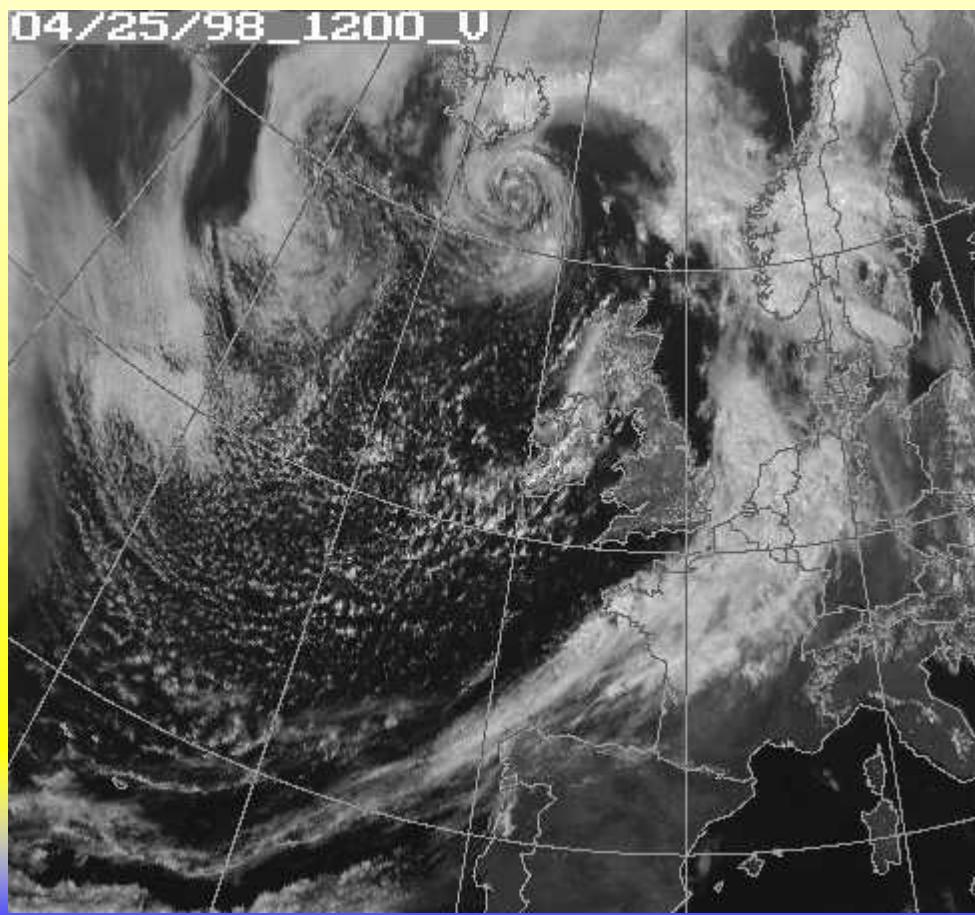
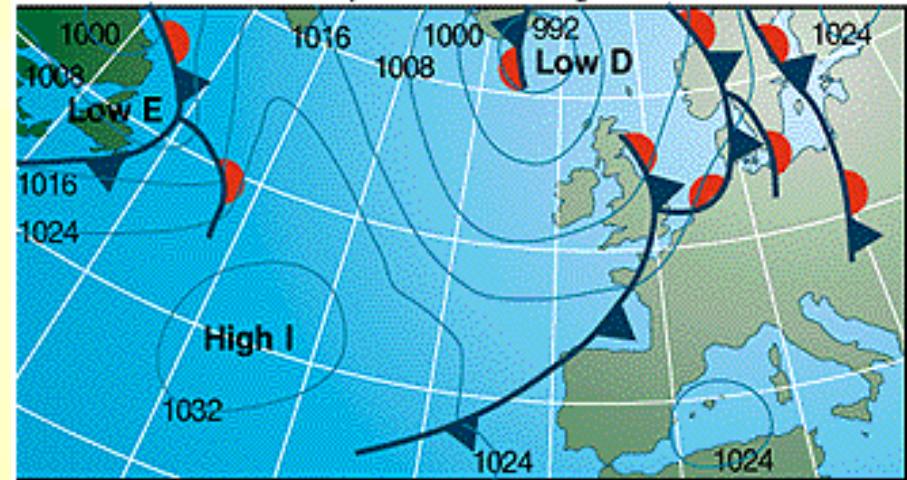
- Day 8:
warm front
down E coast brings cloud and rain



- Day 9:
circulation controlled
by low with double frontal
system; moist Westerly mP air
brings rain



High & Low



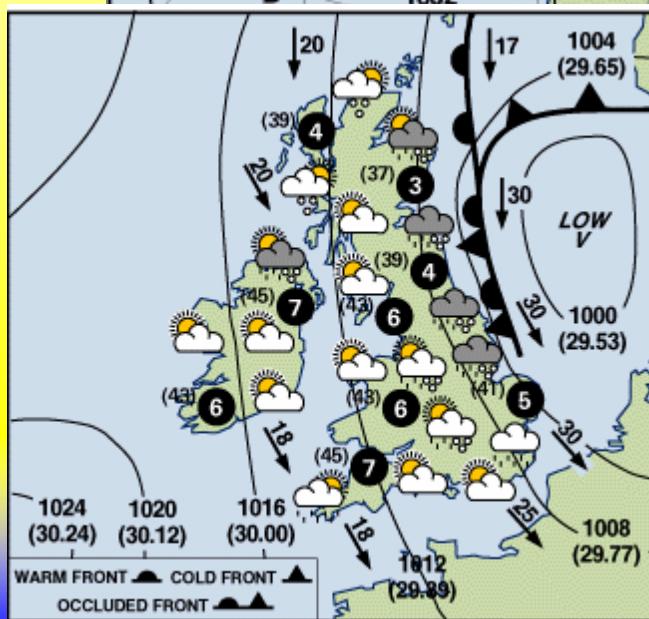
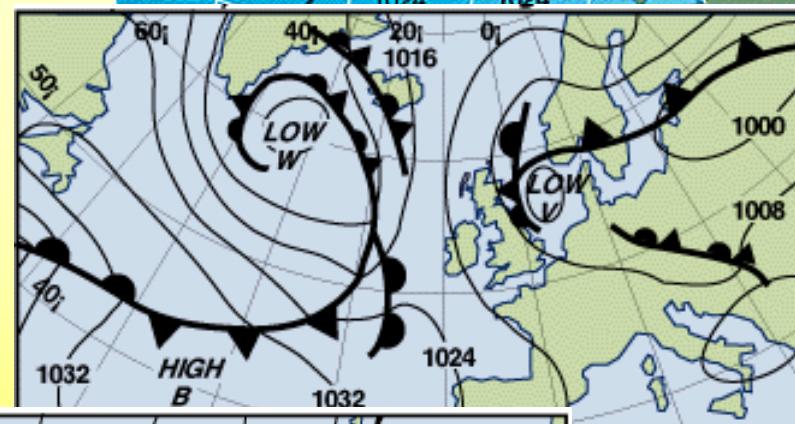
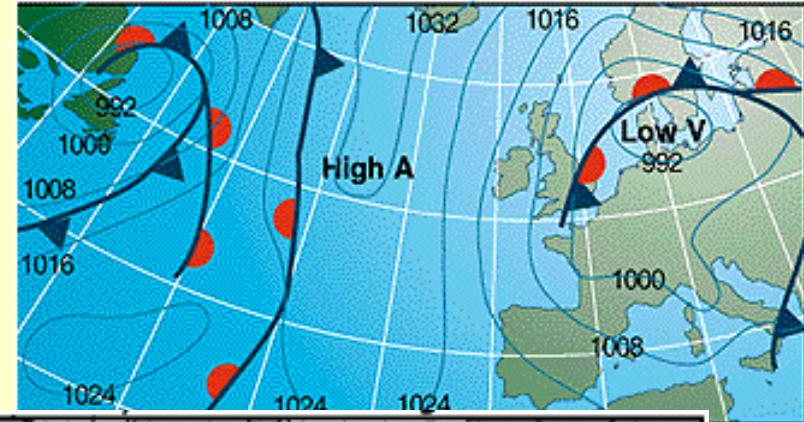
- Meteosat showing low S. Iceland with high pressure building to SW Britain. Note the cold front

Snowy Easter Weekend, April 12

- # Top: Easter Saturday ↗

Right: Monday →

Ridge of high pressure traps low E of Britain which feeds cold cP air from N. Air is moist enough to bring snow



Passing Lows

- April. A sequence of lows can follow each other from the Atlantic across Britain. In this example, dull weather in Aberdeen; brighter weather behind the cold front to the South

