

The weather in Kabul:

The climate in Afghanistan is of course extremely continental, cold winters, and dry hot and dusty summers, with a rather smooth transition in spring in April and May. Kabul at 1791 m is situated in a broad valley area, surrounded by mountains rising to 4000 m, with some tops at 5000 m. On a synoptic scale the weather is dominated by a more or less constant south-westerly jet. Other features are the high over the mountain areas in the north and east, and in the monsoon season a more or less constant low over the lowlands of Pakistan and India. The jet migrates through the year from a southerly position in the winter, to a more northerly position in the summer. In the winter and spring, the central AFG is regularly affected by waves on the jet, and especially March to May there are frequent frontal passages, giving cloudy weather and precipitation. In April lightning is common during the night.

At the end of April and May the jet gradually moves to a more northerly position, and the associated surface lows are mainly affecting the areas from the northern fringes of AFG and northwards. The central AFG is generally not affected anymore, and the weather in Kabul gets gradually more and more stable and dry. In a transitional period in May, there is still some showery activity, but to an increasing degree this is associated with afternoon and evening convection, and less with frontal weather. In this period cloud cover is predominantly convective, and showers are almost always associated with thunderstorms.

The showers have a strong tendency to be stationary in the hills and mountains to the northwest and the southeast of the city. Precipitation and cloud cover is closely connected to the state of the jet. In upper ridges there are often very little clouds. When there is a straight jet with no vorticity advection there are TCU and CB's in the afternoon, but not necessarily precipitation. An upper trough with positive vorticity advection as a rule gives CB's in the afternoon with precipitation and thunderstorms. Often, it can be difficult to see the nuances from the limited selection of fields that we have available, but the upper fields are generally well taken by the models. Hence cloud cover and precipitation are well represented in the model, and the forecaster is usually best off by following the prognosis on this point.

The wind at Kabul is a different proposition altogether, being far less well represented in the models than e.g. precipitation. In general, the Kabul area can be seen as any inland, low-lying, mountain surrounded place, wind usually less than 5 kt, and without any predominant wind direction. Come spring and warmer weather, there is an increasing frequency of strong and gusty wind. Often the onset is extremely rapid, with short lived dust storms with visibility as low as 100 m. Generally the wind is not taken by the models, but can best be forecast based on observation of the cloud cover, and experience. The wind seems to be associated with two sources; In showery weather and CB's in the area it is common with wind of 10-20kt mean, with gusts 20-40kt. Although the direction is uncertain, as a vague rule it can be said to blow in the direction of any nearby active CB's, with strength proportional to the distance to the cloud. Since the most common location of CB's in the area are to the southeast (figure 2) this wind is most common with a northwest to northerly direction, but all directions has been observed.

Another kind of wind is the more constant northerly breeze in the area, locally known as the '120 day wind', because it is a more or less constant feature during the summer months. Usually the wind starts to blow around 14-15 local time, starting as a north-easterly breeze, with a pronounced northwest to northerly maximum around 19-20, and persisting till 21-22 in

the evening. During our stay, at the start of the 120 days, the duration of the windy period showed considerable variability, generally starting earlier and ending later as the May went on. The 120 day wind is in literature said to be associated with the monsoon in India and Pakistan, and the general large scale circulation in the area. We could not see any direct link to convection in the above mentioned areas. Nevertheless, the models took this wind fairly well. Especially the meteograms gave a fairly realistic direction and strength.

The wind in the layers at mountain top level and above was almost always southwest to north-westerly, with the strongest wind usually to the north, in the vicinity of the jet. In the Kabul area the wind at 10 000 ft typically was a gently westerly 05-10kt breeze.

Visibility in the area is affected by the airports proximity to Kabul City, with its 4 million inhabitants. Haze is the rule, with a pronounced low in the morning hours from 6 to 10 of 4-6 km. In July, there was at times reduced visibility also in the afternoon, probably associated with burning of different fuel in stoves, but this more or less ceased to be a problem in May. The end of reduced visibility can be forecast with the aid of the night time sounding, showing the strength of the inversion. Reduced visibility will prevail until the inversion is broken up by the morning sun. As temperature varies fairly little from day to day, a good estimate for this time can be found from last day's temperature curves.

The temperature changes little from day to day. There is of course a pronounced diurnal variation, with a very smooth transition from winter to summer in the maximum temperatures. In mid July, the night minimum temperature was around 18-22 degrees, and days max was 32-35 degrees. Maximum temperatures rarely changed with more than a degree from day to day, except at days with either a frontal passage or precipitation. Compared to climatological mean values, it seems that the temperature was fairly close to the normal.

Kabul stands out from the surrounding areas by having slightly lower daytime temperatures. Typically max in August was at 33-36 in Kabul, whereas most other stations in AFG reported 36-42 degrees.

The models:

The surface fields for MSLP and 10m wind have little value to the forecaster. This because none of the models have sufficiently fine scale to resolve the mountainous terrain that surround the airport. Another problem is the representation of mean sea level pressure in a terrain with height ranging from 1000 – 5000 m.

Some models e.g. the American 25km resolution GFS model and the ECMWF model gave a more or less constant south easterly strong surface field in the border areas between the Pakistani and Indian lowlands and the Himalayan mountain ranges, with this low level 'jet' terminating in the eastern part of Afghanistan, (figure 2). If this jet is realistic, it could explain the general outward flow in the area, giving northerly winds around Kabul. The NOGAPS model gave a slightly different field, with the mountain jet located in the central Himalayan area, and a generally north easterly surface flow over AFG. There were few or none observations confirming a mountain wind available to us at the Kabul. Pressure observations looked fairly coherent, although there was at times a slight underestimation of the low on the Indian side. It was therefore quite difficult to say which model gave the best representation of the MSLP and surface wind. A general feeling among the staff was that none of them was particularly good. A good measure of local knowledge and experience was required.

The best manifestations of the surface fields probably came from the prognostic 700 hPa fields (10000 ft), representing the air mass between the ground and mountain top level. The fields gave a coherent picture of the rather weak westerly flow in the area which to a large extent decided the local wind and weather. In this context it is worth mentioning that in our primary presentation system, the NAMIS, we only had the 700 hPa field available from the British UK met office model. Neither the American models nor the ECMWF model had this field available.

We got a rare glimpse into the weather in central parts of AFG, Chakcharan is a city of some 100.000 people situated in an east-west oriented valley extending through almost all of central AFG. The city lies in a slightly wider part of the valley, with lesser valleys meeting from several directions around the city. The airbase is located in a slight depression in the terrain, surrounded by low hills, and with the mountains some way off. According to the ATC people, the wind was almost always slight and variable, with the rare occurrence of gusts associated with CB activity. Showers or precipitation is rare in the summer, almost all precipitation falling further into the central and eastern mountainous AFG. Reduced visibility was rare, but in the winter there were occasions with cloud cover descending well down on the mountains.

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