

MeteoSwiss; new aeronautical products

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Introduction

In Switzerland, MeteoSwiss provide forecasts and support for aviation. Recently collaboration has increased between the forecaster and both Air Traffic Control (Skyguide), and the operation centre at Geneva airport (APOC).

Some longstanding MeteoSwiss products have been redesigned and new ones created, in order to best respond to the needs of the airport. Here are some examples of these products.

Flight levels

Many flight paths that cross the Alps come under the responsibility of Geneva and Zurich Air traffic control. Every 3 hours MeteoSwiss provide the height of the flight levels FL100 and FL180. The flight levels are calculated using the Payerne

sounding every 12 hours and readjusted every 3 hours using data from the Jungfraujoch and Monte Rosa sites. In the near future, these levels will be calculated from the upper air forecast from the models. The flight levels will continue to be transmitted to the air traffic controller by the forecaster in order to ensure maximum flight safety.

Low-Level Significant Weather Charts (SWC) over the Alps

Since 2016, MeteoSwiss and Austrocontrol have produced a significant weather chart (SWC) centred over the Alps (figure 1). It is updated every 3 hours and replaces the AIRMET. Forecasters from both centres simultaneously compile a chart covering their region of responsibility. They use the same tool, but alternate in being the lead centre. It is a good example of collaboration between two meteorological organisations.

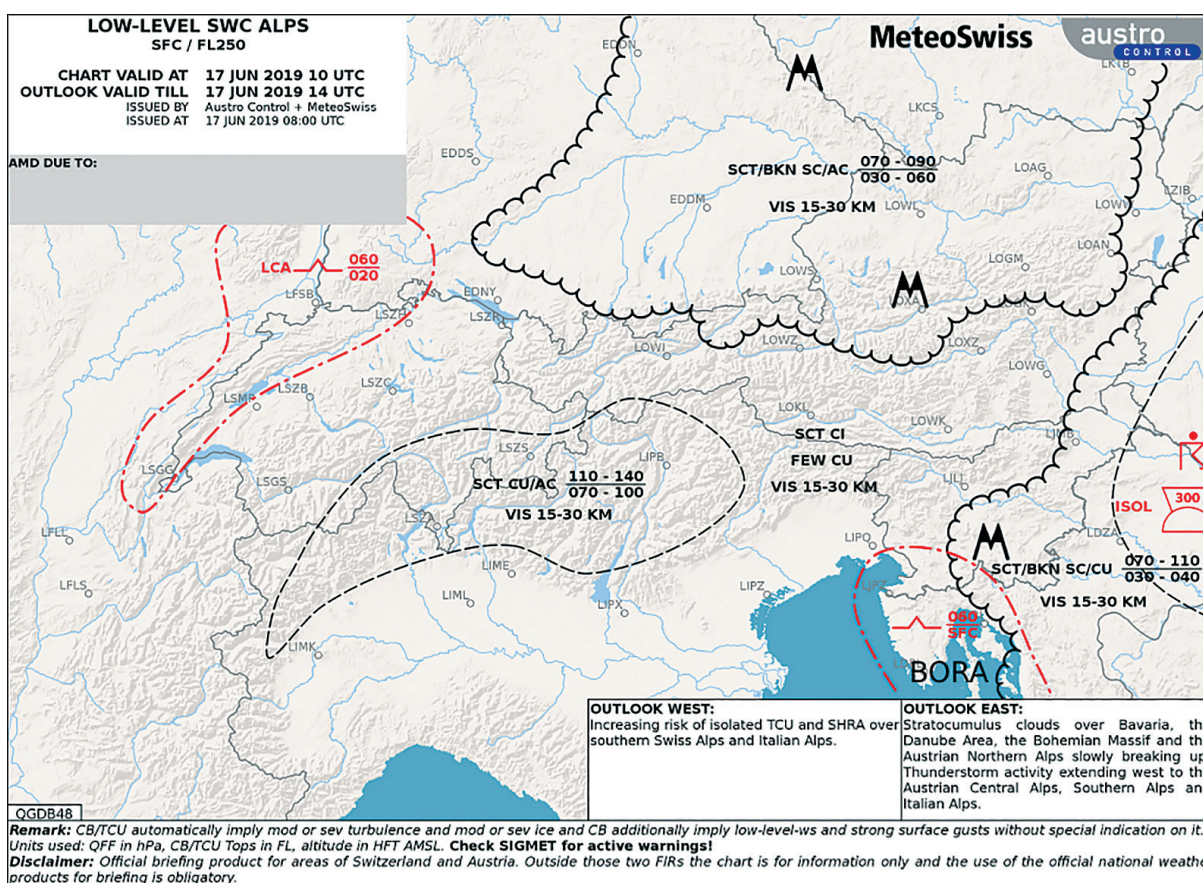


Figure 1 : Low-Level Significant weather chart over the Alps.

Warnings

Meteoswiss issue wind, snow, freezing rain and lightning warnings for the airport areas. These are delivered by the observer during the day and by the forecaster during the night. The lightning warning comprises of two levels, orange and red respectively, for the probability of a lightning strike between 30 and 80 %, and more than 80 %. When the airport is on red alert, no plane refuelling is allowed and the passengers are not allowed to disembark. The financial consequences of such an alert are important for the airport authorities; the alert must be as long as necessary, but as short as possible.

A new product: Cumulonimbus (CB) forecast

Switzerland lies at the crossroads of many flight paths. The traffic is very dense, comparable to that of the UK, Belgian or German air spaces. The presence of CB in the area can generate serious delays. The air traffic controllers reduce the number of movements by 10 to 15 % if CBs are forecast, and by 20 to 25 % if CBs are present. A good forecast is essential in order to anticipate the reduction of traffic. In the past, air traffic controllers used the METARs and the TAFs to estimate the risk of CBs. However, this was not satisfactory.

Situation générale	Trainée active	Perturbation	Marais barométrique	Autre
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Probabilité d'orages								
Région / heure (UTC)	06-09	09-12	12-15	15-18	18-21	21-24	00-03	03-06
1. Bourgogne	20-40	0-20	40-60	40-60	20-40	0-20	0-20	0-20
2. Lyon sud	40-60	40-60	80-100	60-80	0-20	0-20	0-20	0-20
3. Alpes françaises	20-40	40-60	40-60	80-100	20-40	0-20	0-20	0-20
4. Alpes italiennes	0-20	40-60	20-40	60-80	20-40	0-20	0-20	0-20
5. Alpes valaisannes	0-20	20-40	20-40	60-80	40-60	0-20	0-20	0-20
6. Alpes bernoises	0-20	20-40	40-60	60-80	40-60	0-20	0-20	20-40
7. Plateau	0-20	0-20	0-20	60-80	60-80	20-40	20-40	20-40
8. Jura	0-20	0-20	0-20	60-80	60-80	20-40	0-20	0-20
9. Alsace	0-20	0-20	0-20	20-40	40-60	40-60	20-40	0-20

Type d'orages	Isolés	Fréquents	Front orageux	Supercellule
	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Orientation	Quasi-stationnaire	SW	W	NW	N	NE	E	SE	S
	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Complément :
Top cb : FL 340 - 380

Remarques :
En fin d'après-midi rapide formation d'une ligne orageuse sur une ligne Valence-Grenoble-Lyon-Dijon ainsi que sur les Alpes Françaises, laquelle prendra de l'ampleur en traversant toute la Suisse environ entre 15 UTC et 20 UTC. Cette ligne orageuse pourra produire de violents orages (violentes rafales, grêle, pluie intense, foudre).

Figure 2 : Cumulonimbus forecast during the crossing of a squall line.

Since the summer of 2018, a new forecast has been provided by MeteoSwiss for Air Traffic Control, consisting of the probability of thunderstorms in 8 regions situated in a radius of about 180 km around Geneva for the following 24 hours (figure 2). The probability for a 6 hour period, the type of thunderstorm (isolated, frequent, front and supercell), the direction of the flow and the most affected regions are described along with the top of the CBs.

The product is compiled in the early morning, followed by a telephone call to the air traffic controller at 8 am and also at midday, if the weather situation is critical.

Another new product The Dashboard

A new platform has been developed in collaboration with MeteoSwiss, Meteotest and the airport authorities in order to provide a tool through which forecasts, observations, satellite pictures and warnings are displayed. This dashboard (figure 3) is available in both the operation centre at Geneva Airport (APOC) and in the forecasting room at MeteoSwiss. Both MeteoSwiss's forecasters and the APOC have access to the same display which is an advantage when describing the weather situation during the daily telephone call.

Two display modes are available, for winter and summer respectively. The former shows the probability of runway contamination and the latter the probability of thunderstorms. These probabilities are renewed every 3 hours by the forecaster for a range of up to 24 hours.

The forecast is provided by Data4web which is a forecast generator for each location in Switzerland that is based on model data, INCA and the forecaster's input through an editor.

Regional and airport alerts are also displayed.

Forecast for the charter season

During the winter season, especially during holidays and weekends, the amount of air traffic is very intense due to the increase in the number of charter flights from 40 movements during an average day, up to 90 movements during peak days.

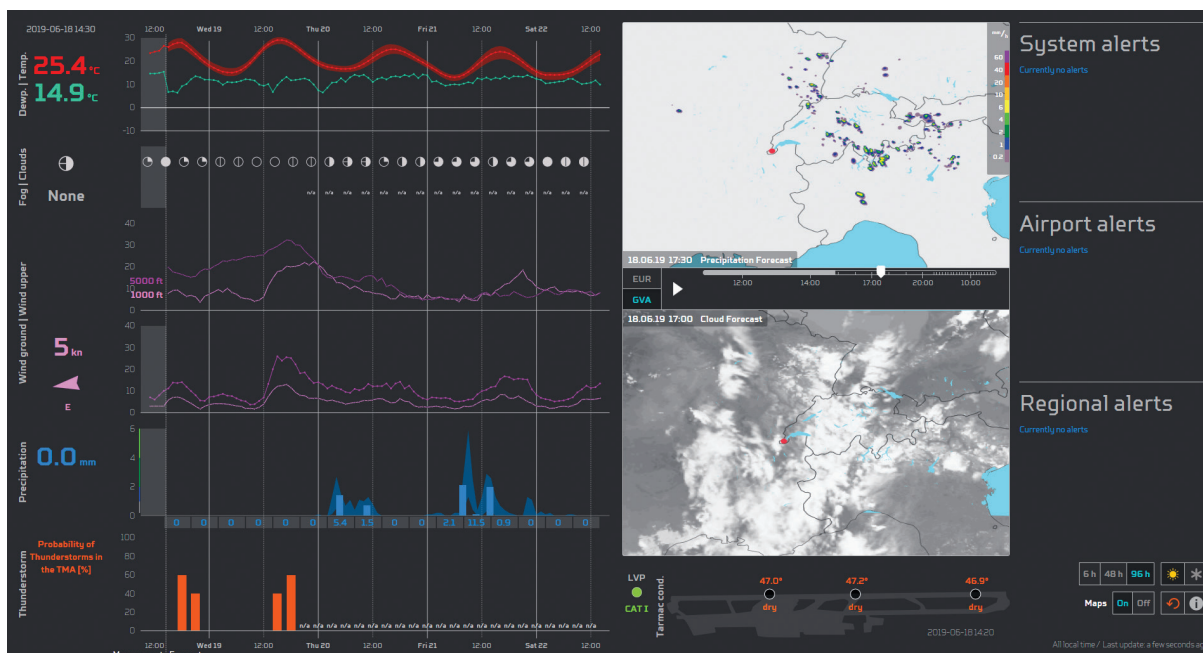


Figure 3: Dashboard LSGG. On the left, the forecast temperature, dew point, cloud, wind and precipitation (with spread). The bottom line shows the thunderstorm probability introduced by the forecaster. The middle section shows the radar and the satellite pictures (observed and predicted) and the actual temperature and state of the runway. The right section shows the current warnings.

Meteogram Airport Zürich, 18.06.2019 13 - 12 UTC

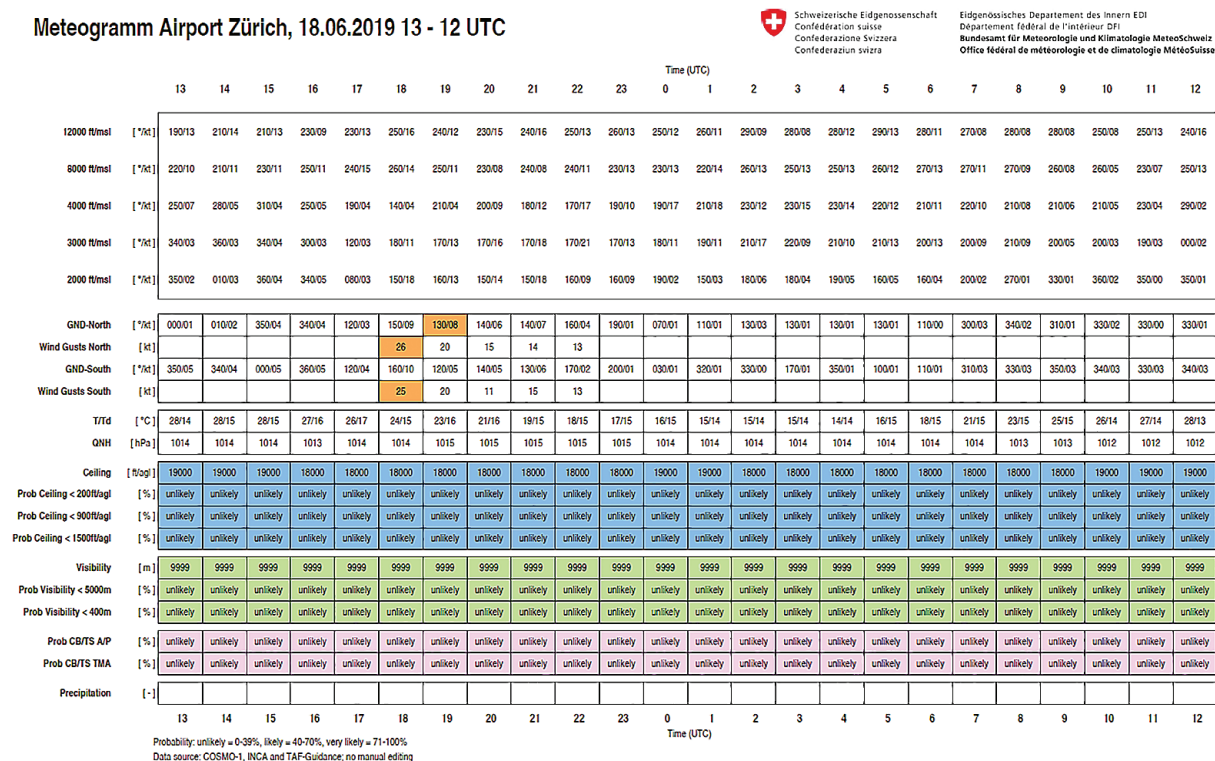


Figure 4: Meteogram for Zurich airport.

Most of the airport services are operating at full capacity during these peak days, especially the airport access, the luggage transfer and the passport control teams. Any delays or problems could spread to affect the various services and create a crisis situation.

Bad weather conditions constitute a high risk for delays; not only as a result of the conditions at Geneva Airport, but also at the departure airports in the UK, Russia, USA, Canada and Scandinavia. The access to the airport is also critical since parking spaces are limited, especially for buses.

MeteoSwiss issue a charter forecast every Friday during the winter season which enables the APOC to predict delays due to weather hazards in departure airports, and on roads to ski resorts.

Stand by service

A forecast is issued three times a week, in order to manage staff in charge of snow clearing, and to organise a stand by service. The airport receives an estimation of the risk of snowfall for the following 3 days.

Meteogram

A new meteogram for Zurich and Geneva airport (figure 4) will be soon available via the platform for Air Traffic Control (Skyguide). It will be based on INCA, COSMO1 and TAF guidance based on MOS. Since the models could be inconsistent with the TAFs, the meteogram is corrected by the actual TAF data. The meteogram is updated every hour.

Conclusions

Recently, MeteoSwiss, in collaboration with Geneva airport authorities and Air Traffic Control, have developed new products and updated some older ones, in order to optimise the management of the flights and the various services linked to the airport.

Some products are fully automatic and are generated using observation data, model data and the forecaster input through a matrix editor.

The task of weather forecasting is changing rapidly; more and more products are generated automatically allowing the users to retrieve weather information using apps on mobile phones. However, when an important decision needs to be taken, a dialogue with a professional is essential.

In the example of the airport, all products are supported with a call to the authorities in order to express the uncertainties and the eventual doubts about the accuracy of the automatic products.