5.5 Hourly analysis

Horizontal wind and temperature fields are analyzed every hour in order to assist forecasters in issuing meteorological warnings. Images from the hourly analysis also are available to users in aviation sector through meteorological information web page. The configuration of the hourly analysis system is listed in Table 5.5.1. The analysis uses the latest forecast from the meso-scale model (MSM) as the first guess, and multi-variate optimum interpolation (OI) scheme is utilized to assimilate wind and temperature observational data. The wind observations assimilated are from wind profilers, Doppler radars (Volume Velocity Processing (VVP) wind), ACARS (Aircraft Communications Addressing and Reporting System), satellite (Atmospheric Motion Wind (AMW)), and AMeDAS (Automated Meteorological Data Acquisition System), and the temperature observations are from ACARS and AMeDAS. Data cut-off time is set to be at 20 minutes past the hour in order to distribute the products around 30 minutes past the hour.

The analysis is performed over the full MSM domain (Fig. 4.5.1), with the horizontal grid spacing of 5km. Top of the analysis field reaches up to about 150 hPa. The analysis variables are horizontal wind velocity components (u and v) and temperature. Correlation between the wind and temperature fields is not taken into account. Surface and upper air analysis are separately performed, and different configurations are used regarding the forecast and observational errors. In the surface analysis, forecast error correlation length (half-width of the horizontal correlation) is taken to be smaller than that in the upper air analysis. Observational error for the AMeDAS data in the surface analysis also is set to be smaller compared to those for the observations in the upper-air. These help the surface analysis field to closely reflect small-scale meteorological structures represented by densely distributed AMeDAS data.

Table 5.5.1 Configuration of the hourly analysis system.

	surface analysis	upper air analysis
analysis scheme	2-dimensional optimum interpolation	3-dimensional optimum interpolation
assimilated observation	AMeDAS (wind, temperature)	wind profiler, Doppler radar (VVP wind), ACARS, hourly satellite wind, AMeDAS (temperature)
first guess	the latest forecast from MSM (forecast time = 2-4 hours)	
analysis variable	horizontal wind (u and v components), temperature	
domain	the MSM domain, grid spacing 5km, vertical levels up to about 150 hPa	
analysis time	on the hour every hour (calculation starts at 20 minutes past the hour)	
product distribution	around 30 minutes past the hour	