The Generation of Site-Specific Guidance Based on the Ensemble Forecast

CHEN Chaoping[1]　YANG Qian[2]

1.Sichuan Meteorological Observatory,Chengdu,610071,China

2.Chengdu University of Information Technology，Chengdu，610225，China

Abstract

Based on ensemble forecast products, a refined objective forecast techniques named SPCO_ECEPS is established for 157 stations of Sichuan province since 2017. The 1-7days temperature and precipitation forecasting equations are established by different ways, the temperature use MOS method and error correction, the precipitation use probability matching fusion method and error correction. Using the three weather elements including 24h 2m maximum /minimum temperature, the 24h 2m average temperature change and 24 hour rainfall observations at 157 stations from 1 January to December 31, 2018, the 24 hour products of SPCO_ECEPS and SPCO_ECCTL (Refined objective forecast techniques based on ECEPS control member) are verified. The results show that: (1) the 24h maximum/minimum temperature, the SPCO_ECEPS forecast skill is higher than SPCP_ECCTL, and the clear-rain forecast skill，the SPCO_ECEPS is lower than the SPCO_ECCTL, but for the heavy rain(>=50mm) forecast skill, the SPCO_ECEPS is better than the SPCO_ECCTL . (2) With the time going, the different valid time mean absolute error of 24h 2m maximum /minimum temperature that the SPCO_ECEPS and SPCO_ECCTL produced are both increased, but the accuracy rate of clear-rain that the two techniques produced are decreased. (3)the mean absolute error from day1-day3 valid time of the 24h 2m maximum temperature that the SPCO_ECEPS and SPCO_ECCTL produced are both no more than 2.0℃, and the day4-day7 exceed 2.0℃.The 24h 2m minimum temperature mean absolute error from day1-day7 valid time that these two methods caused are all bellow 2.0℃.(4) in a case of heavy rainfall progress that occurred from 12UTC 10 July to 12UTC 11 July 2018, the SPCO_ECEPS is more forecast skills than the any other methods.(5) the SPCO_ECPS can predict the changing trend of 24h 2m average temperature change. In a word, the objective forecast techniques are the basis of the forecaster producing refined forecast products, and the SPCO_ECEPS technique can give powerful technical support for site -specific guidance.

Data and Methodolology

➢ Data

Observation data: 24h 2m maximum/minimum temperature, 24h 2m average temperature, 24h precipitation

Forecasting data: Refined forecast data produced by the objective forecast techniques-the SPCO_ECEPS and SPCO_ECCTL , EC EPS 24h precipitation products

➢ Research Area

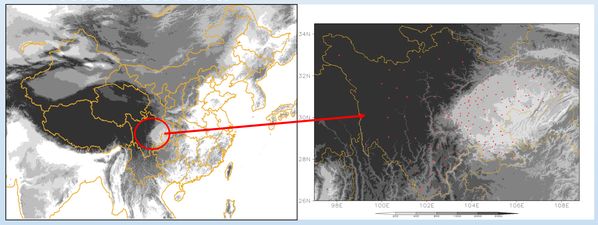

Fig.1 Research area (Sichuan Province, China), the 157 research stations（red dot）

➢ Objective Forecast Technique

✓ **SPCO_ECEPS:** Based on the explanation and application of EC_EPS numerical forecast model products, an operational MOS prediction system and a set of real time statistical prediction equations are established for 157 stations in Sichuan province.

✓ **SPCO_ECCTL:** Based on the explanation and application of EC_EPS control member

➢ Test Method

TS , failed forecast rate, empty forecast rate, RMS error, synoptic verifications

Results

➢ Seasonal Comparison

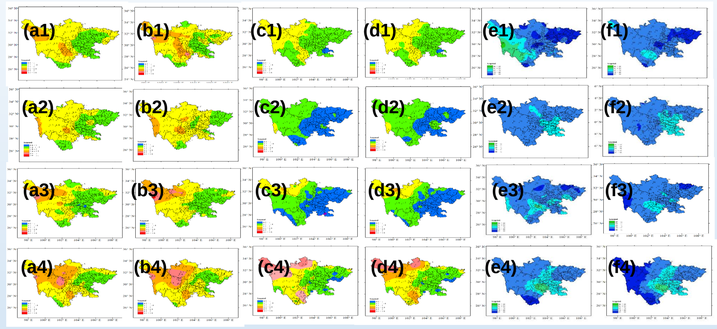

Fig.2 Comparison of 2mTmax mean absolute error (a: SPCO_ECEPS, b:SPCO_ECCTL), 2mTmin mean absolute error (c:SPCO_ECEPS, d:SPCO_ECCTL),clear-rain accuracy rate (e:SPCO_ECEPS, f:SPCO_ECCTL) in day1 valid time, 1:Spring, 2:Summer, 3: Autumn , 4: Winter

➢ Monthly Characteristics

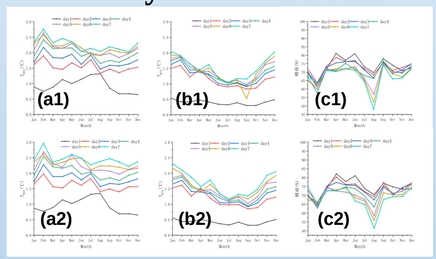

Fig.3 Comparison of SPCO_ECEPS(1),SPCO_ECCTL(2) (a: Tmax , b: Tmin , c: clear-rain accuracy rate) from day1 to day7 valid time

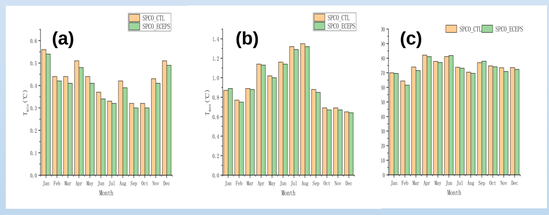

Fig.4 Day1 valid time comparison of two methods, (a:2m Tmax mean absolute error, b: 2m Tmin mean absolute , c: clear-rain accuracy rate)

➢ A Heavy Rain Case

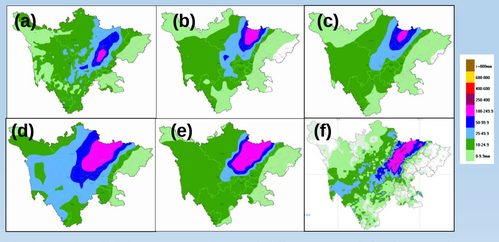

Fig.5 Day2 valid time comparison of different precipitation products, (a):ECMWF,(b):SPCO_ECCTL,(C):ECEPS-MEAN, (d) ECEPS_MAX, (e): SPCO_ECEPS, (f): OBS (12UTC10Jul. to 12UTC11Jul.,2018)

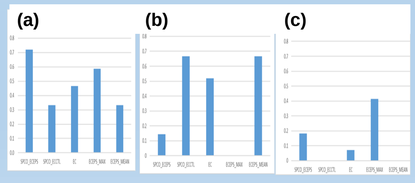

Fig.6 Day2 valid time forecasting skills of different precipitation products, (a: TS, b:Missing prediction rate , c:Failed predication rate)

➢ A Decreasing Temperature Case

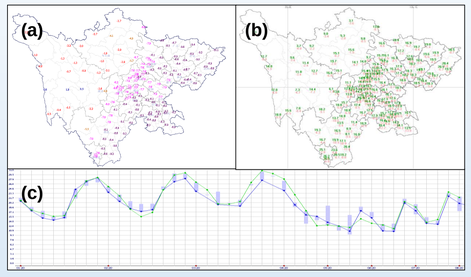

Fig.7 12UTC 1 Apr. forecast the 72h average 2m temperature changing from12UTC 4 Apr. to 12 UTC 6 Apr. 2018 (a) , the 72h average 2m temperature OBS (b), 0-168h 2m temperature of 3h interval diagram (blue line: SPCO_ECEPS , green line : OBS, light blue box: the region of different ways)(c)

➢ Conclusion

(1) the 24h maximum/minimum temperature, the SPCO_ECEPS forecast skill is higher than SPCP_ECCTL, and the clear-rain forecast skill，the SPCO_ECEPS is lower than the SPCO_ECCTL, but for the heavy rain(>=50mm) forecast skill, the SPCO_ECEPS is better than the SPCO_ECCTL .

(2) With the time going, the different valid time mean absolute error of 24h 2m maximum /minimum temperature that the SPCO_ECEPS and SPCO_ECCTL produced are both increased, but the accuracy rate of clear-rain that the two techniques produced are decreased.

(3) the mean absolute error from day1-day3 valid time of the 24h 2m maximum temperature that the SPCO_ECEPS and SPCO_ECCTL produced are both no more than 2.0℃, and the day4-day7 exceed 2.0℃.The 24h 2m minimum temperature mean absolute error from day1-day7 valid time that these two methods caused are all bellow 2.0℃.

(4) in a case of heavy rainfall progress that occurred from 12UTC 10 July to 12UTC 11 July 2018, the SPCO_ECEPS is more forecast skills than the any other methods.

(5) the SPCO_ECPS can predict the changing trend of 24h 2m average temperature change.

The objective forecast techniques are the basis of the forecaster producing refined forecast products, and the SPCO_ECEPS technique can give powerful technical support for site -specific guidance.