A case of Nowcasting based on the identification of air masses boundaries

KONE Diakaria, Engineer Forecaster;
National weather service, fax: (00225)21277163, Côte d'Ivoire, konediakaria@yahoo.fr
(April 26, 2007)

I. INTRODUCTION

In the African tropical zone, in particular in Ivory Coast, the precipitations are mainly based on convective initiation and very difficult to forecast. During the West African meteorological measurement campaign "AMMA", which was held in Niamey in Niger during the period of wet season (from July to September) 2006, results of verifications of the main numerical weather prediction models has showed their weak skill to predict convection, even at one day range. The convective cell from which majority of thundery and rainy events are generated, is of space scale of approximately 10km.

So thus to optimize the predictability of the convective phenomena in Ivory Coast, we stressed on Nowcasting.

The case that we present to you here is a case of Nowcasting based on the identification of boundaries of air masses from the satellite imagery. It was observed on December 28, 2005 between 09h15 and 15h30 UTC in the South East of Ivory Coast.

II. PRESENTATION OF CASE

First of all , let us announce that Ivory Coast is a coastal country where it reigns in the south an almost permanent coastal breeze and which generally becomes active at the early afternoon.

Also, it frequently occurs in period of dry season or the pre-onset, that the surface wind flux shifting from south towards north and wetter is blocked in its rise towards north by a drier and heavier air moving southwards. This very intense dynamic forcing often results by reversal of the wet flow in direction reverses of its initial displacement. This process of returned flux, very often occurs up to 925 hPa. The figure II.1 illustrates the case described above.

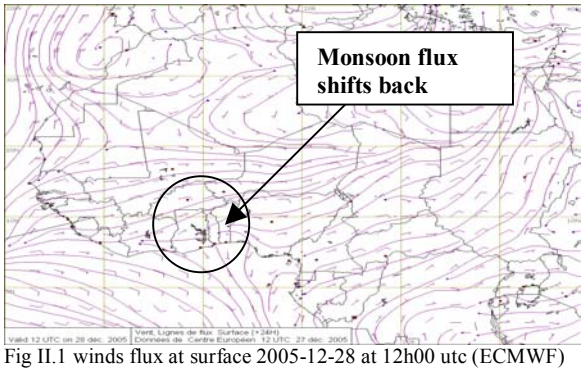

Fig II.1 winds flux at surface 2005-12-28 at 12h00 utc (ECMWF)

This reversal of monsoon flux creates a front of separation between two air masses. This generates a convergence zone, then the appearance of convective cluster.

The addition effects of the sea breeze in the early afternoon, very often boosts the phenomenon and can cause intense thundery rainy activities;

III. RESULTS AND CONCLUSIONS

The presentation of this case of Nowcasting which will have to be a case of study with the goal to better understand the process of reversal of monsoon flux, showed another approach of convection forecast. When a boundary of air masses is very early detected as illustrated on figures III.1, III.2 and with the taking into account of the diurnal coastal sea breeze, then it is possible to forecast in a relatively short time thundery rainy events susceptible to affect the human activities such as aviation.

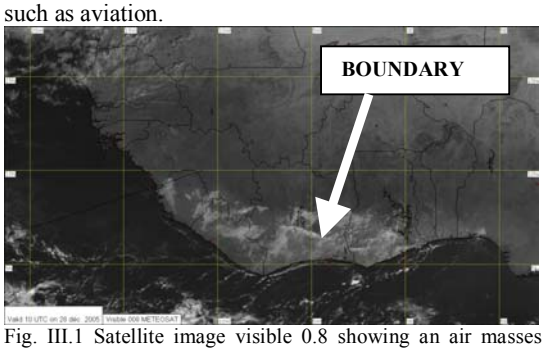

Fig. III.1 Satellite image visible 0.8 showing an air masses boundary resulting from the return of monsoon flux at 10H00 UTC

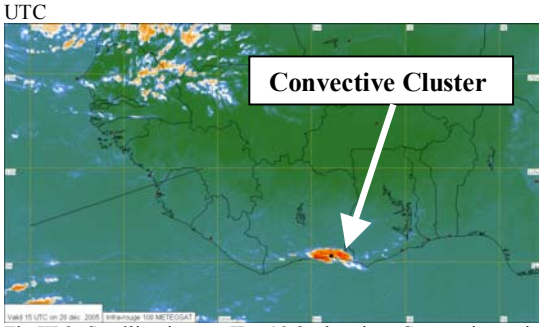

Fig.III.2 Satellite image IR. 10.8 showing Convective rain generated at 15H30 UTC over the South East of Ivory Coast resulting from the return of monsoon flux with addition of diurnal sea breeze.

IV. ACKNOWLEDGMENTS

My sincere appreciations to the Director of the Met service:GUEI Goroza, the Chief of the forecast unit:ALIOUNE Kamara, my colleagues forecasters and the maintenance team of the system (PUMA) from which we collected all the data.

V. REFERENCES

Etude Multivariables de la dynamique des systèmes convectifs en Afrique de l'Ouest, 2005 : KONE & KOFI

Gérard De Moor, 1982 : Les théories de la turbulence dans la couche limite atmosphérique

Jean COIFFIER, 1996 : Eléments de prévision numérique du temps