TRACKING MESOSCALE CONVECTIVE SYSTEM CORES OVER NORTHERN SOUTH AMERICA USING OVERLAPPING TECHNIQUE

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It has been observed in recent years that usually, during the hurricane season, at least 1 Tropical Storm (TS) takes place approaching northern South America. For instance, the TS Bonnie that occurred in 2022.

Fig1. Track of TS Bonnie. Image taken from: https://images.app.goo.gl/erWTZwC972ot8XR58

Real time tracking of Mesoscale Convective Systems (MCS), associated with these TS can provide valuable information for forecasting purposes.

1. INTRODUCTION

Some approaches have been suggested for tracking MCS, as overlapping technique (Williams & Houze, 1987), spatial correlation Patterns (Carvalho and Jones, 2001), projected-cloud-edge tracking techniques and others.

However, due to its simplicity, the overlapping method is used in this work for tracking Mesoscale Convective Systems Cores (CC) over northern South America.

2. METHODOLOGY

Generally, the approach described (Vila, e.a. 2008) for tracking CC is used. First, areas in the GOES IR image with brightness temperature less than a threshold value (215°K, i.e., the core of the cloud mesoscale system) are identified and then tracked in subsequent images every 10 minutes. If within two successive IR images, a CC overlaps itself by more than 25% of its area, this cloud system is considered as the same system and its track continues. A line connecting the different positions (with time) of the geometric center of the CC is then drafted. The geometric center is defined as the average latitude and longitude of all pixels belonging to the identified CC.

3. RESULTS

On August 20, 2023, tropical storm Franklin approaches the northern coast of South America. At 02:40Z it was located near 14.6N 67.1W. Two MCS (CC1 And CC2) were tracked and highlighted within a rectangle in Figs. 2 and 3. Later, these two systems merged together and formed a huge convective system (Fig. 4).

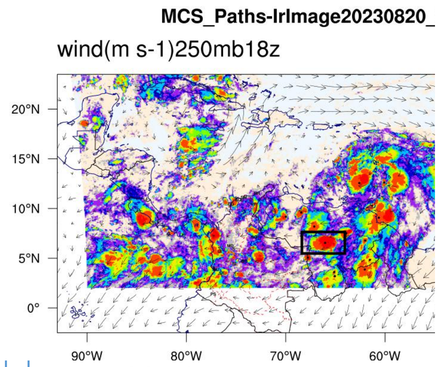

Fig. 2. CC1, (highlighted within a rectangle) formed within an outer convective band of TS Franklin (located at this time to the NE of CC1).

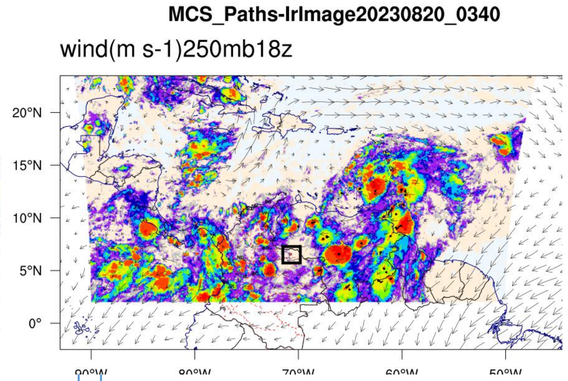

Fig. 3. Convective core CC2 (Highlighted withing a rectangle) no associated with convective bands of tropical storm Franklin and formed west of CC1 one hour later.

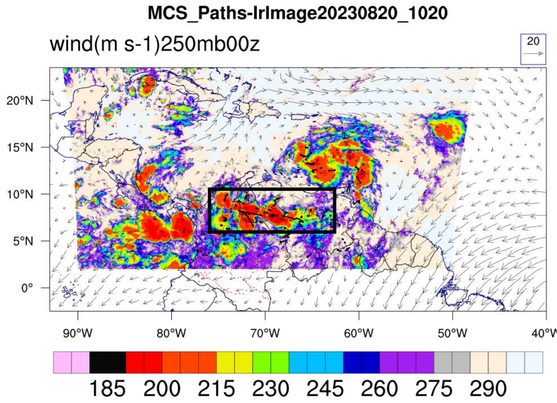

Fig.4. A huge MCS formed by merging of CC1 and CC2. Broken black segments (within the rectangle) indicate the CC track. This wider system moved following the wind circulation of TS Franklin.

4. SUMMARY AND FUTURE PLANS

Two MCS were tracked using the overlapping technique. The obtained information may be useful for forecasting and researching purposes. Also, a shortcoming of the overlapping procedure is that it produces nonphysical values when merging or splitting occurs. Thus, an approach for computation of the geometric center of the CC, based on a mass conservation criterion, is under developing. A preliminary test of this new procedure shows very encouraging results when merging or splitting occurs.

5. LITERATURE

Carvalho and Jones 2001: A satellite method to identify structural properties of mesoscale convective systems based on the maximum spatial correlation tracking technique(MASCOTTE). j. Appl Met. 40 1683-1701.,

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