Determining Cloud Seeding Target Area Using HYSPLIT Model

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Introduction

Cloud seeding is one of the most known aspects of weather modification in most regions of world, that according to the World Meteorological Organization among all weather modification applications, most of operational projects were focused on the increase in rain. Determination of the area under effect of seeding materials, known as the target area during measuring its efficiency is one of the most challenges in applying the cloud seeding method. In the current method of determining the target area, in measuring the cloud seeding project in Iran, the seeding materials from shooting place is transferred in GIS environment for two hours using wind speed and direction output of WRF mode in wind direction. Considering the complexities and lack of present sureness in determination methods of target area, in this paper it was attempted to provide a new method in order to determine the target area using the martial distribution model.

Materials and Methods

In the introduced in this article, in order to study the HYSPLIT dispersion model performance in determining cloud seeding target, selecting one of the seeding flights, WRF model was carried out for this date using FNL data by one degree in longitude and latitude direction, and the output was extracted with time resolution up to 5 min for duration of operational flight time in cloud seeding and was introduced to HYSPLIT model as the input meteorological parameters. Since according to the performed projects, the duration of effect of seeding materials on the target area is considered two hours, the specifications of the carried out shoots in the operational flight time interval was given to HYSPLIT dispersion model in order to calculate the two hours transfer and output model is determined as an area via proper software.

Results and discussion

The overlapping of the target area calculated by the method introduced in this paper, and the common approach to determine the target area in Iran using GIS software revealed that both areas are in good conformity with each other and they are overlapped in the most regions. The areas without overlap can indicate the deference in the obtaining output points in HYSPLIT model and martial travels method on the plan. Since, 3D transit and turbulences are considered in HYSPLIT model. Also, two regions on the radar algorithm showed the proper overlap.

Conclusion

Comparison of the target area calculated by both mentioned methods in this article indicated so much similarity between these two regions and overlap between these both regions is seen, and it seems that the calculated region with numerical modeling can be the proper alternative for the accounted area by the current method is applied.

In order to obtain the more accuracy in determining the target area of cloud seeding, finding the proper more reliable method to be replaced by the current method, it is suggested that in further studying about this method for several operational flights, at least the operational flights of an operational project are used and the results should be studied carefully.

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