

Relationship between a maximal radar reflectivity of frontal convective clouds of Kakheti Rregion of Georgia from mean intensity of atmospheric precipitation

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Abstract

The dates of radar observations by convective clouds of a warm season are parsed. They were carried out in Kakheti region of Georgia at passing cold atmospheric fronts. The values of radar reflectivity (Z) of these clouds was compared to intensity of the dropped out atmospheric precipitation. The empirical relationship between these meanings was retrieved. The reliability coefficient of the retrieved relationship is equaled 0,59 at confidence probability 0,93.

Fresh water a most valuable mineral on the Earth. An alone source of replenishment of its reserves is the atmospheric precipitation. By means of clouds above ground there is reallocating this valuable mineral. Therefore registration of its amount and reserves is the major task of a modernity.

At the modern level achievements of science the radar is one of instruments permitting in a real time, in great territories and with sufficient for practical fidelity purposes to measure intensity and total value of atmospheric precipitation.

Comparison of data of radar measuring of a reflectivity of clouds (Z) and the intensities of atmospheric precipitation (I), dropped out above ground, different explorers have enabled to place correlation link between them. The analytical link between Z and I was theoretically retrieved, which one looks like [1]:

$$Z = A I^b,$$

where A and b constant coefficients depending on an aspect of a distribution function of cloudy fragments on sizes in settlings. In practice these constant coefficients are determined by an experimental way.

In practice these constant coefficients are determine by an experimental way. On the values A and b are influence many the factors, such as: the magnitude of the measured intensity (is intensity gentle or strong), appearance of atmospheric precipitation (snow or rain), climatic conditions of region, where is carried on overseeing by clouds, synoptic conditions of formation and progressing of clouds etc.

In the represent paper the attempt is undertaken to learn influencing on values of these coefficients of synoptic conditions of origin and progressing of a cloud.

To analysis the dates of long-term radar overseeing on convective clouds held in Kakheti region of east Georgia have undergone. Observed clouds, the number compounds which one 460, were developed and produced settlings at passing cold atmospheric front

The observations clouds were carried by four radars (X band radar) such as MPJI-5 (Soviet commodity). The radars in region were posed approximately uniformly. From radar observations of cases such selected, which one in place and time has coincided with measuring of intensity and total values of atmospheric precipitation.

The information about the dropped out atmospheric precipitation were fixed by six meteorological stations.

The choice of frontal clouds is conditioned by that in the indicated region with them are bound a specially the intensive precipitation.

In Fig. 1 the trend of relationship of a logarithms maximums of a radar reflectivity (Z) of precipitation from of a meaning of a logarithms of their intensity (I) is presented.

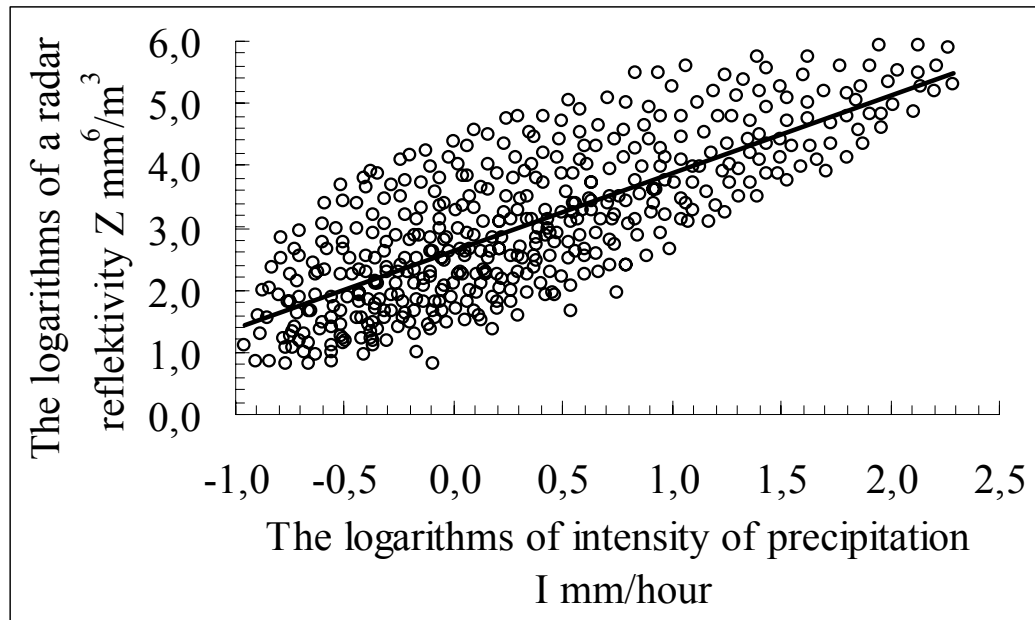


Fig. 1. Trend of relationship of a logarithms maximums of a radar reflectivity (Z) of precipitation from of a meaning of a logarithms of their intensity (I)

Based on the comparison of radar reflectivity factor measurements for a range of 40 km and rainfall rates measured at the ground, 5 summers, the best Z-I relationship for Kakheti region of Georgia storms was found to be:

$$Z = 436 I^{1.25},$$

where Z is in mm^6/m^3 and I is in mm/h.

The index of reliability of this relationship is equaled 0,59, at confidence probability 0,93 %. According to our reckoning the Z-I relationship is the one that should be used for hydrological applications of radar data.

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Связь между максимальной радиолокационной отражаемостью фронтальных конвективных облаков теплого сезона года Кахетинского региона Грузии с средней интенсивностью выпадающих из них атмосферных осадков

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Резюме

Проанализированы экспериментальные данные одновременных измерений максимальной радиолокационной отражаемости (Z) конвективных облаков теплого сезона года, образование и развитие, которых происходили при прохождении холодного атмосферного фронта в Кахетинском регионе Грузии со средней интенсивностью, выпавших из этих облаков осадков (I). Объем выборки составил 460 случаев. Найдено эмпирическое уравнение связи между Z и I. Показатель надежности аппроксимации равняется 0,59 при уровне доверительной вероятности 0,93.

Считаем, что полученные результаты могут быть использованы для мониторинга гидрометеорологических процессов в данном регионе.

კავშირი საქართველოს კახეთის რეგიონის თბილი სეზონის ფრონტალური კონვექციური ღრუბლების მაქსიმალური რადიოლოკაციური ამრეკვლადობასა და მათგან მოსული ატმოსფერული ნალექების საშუალო ინტენსივობას შორის

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რეზიუმე

გაანალიზებულია საქართველოს კახეთის რეგიონის თბილი სეზონის ფრონტალური კონვექციური ღრუბლების მაქსიმალური რადიოლოკაციური ამრეკვლადობის (Z) და ამ ღრუბლებიდან მოსული ნალექების საშუალო ინტენსივობის (I) შესახებ მონაცემები. სტატისტიკური ამონაკრების მოცულობამ შეადგინა 460 შემთხვევა. ნაპოვნია Z - I დამოკიდებულების ემპირიული განტოლება. აპროქსიმაციის საიმედობის მაჩვენებელი 0.59-ის ტოლია, ხოლო ნდობის ალბათობა 0.93-ს უდრის.

მიგვაჩნია, რომ მიღებული შედეგები შეიძლება გამოყენებული იქნას მოცემულ რეგიონში ჰიდრომეტეოროლოგიური პროცესების მონიტორინგისთვის.