On the existence of the September Taurid shower

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An analysis of paths of 1906 meteors observed in the middle of September 1996-2000 during almost 400 hours collected by Polish *Comets and Meteors Workshop (CMW)* shows no trace of September Taurids activity. The maps computed by RADIANT and ComZHR software show existence of δ-Aurigids and α-Triangulids radiants but no signature of September Taurids. Also the ZHR profile computed using the radiant position given in [1] shows only scatter at the level of ZHR ≈ 1 with no clear enhancement around predicted maximum of the activity of the shower.

1. Introduction

Recently S.J. O'Meara [1] reported a discovery of new meteor shower. In the middle of 2001 September he observed quite fast meteors radiating from area around $\alpha = 61^\circ$ and $\delta = +22^\circ$.

This shower, called September Taurids, attracted attention of two Bulgarian observers who during the night of 2002 September 14/15 witnessed its quite strong activity. Among 35 plotted meteors as many as 9 seemed to radiate from the radiant at $\alpha = 61^\circ$ and $\delta = +21^\circ$ [2].

Both these investigations derived similar parameters of the stream independently, suggesting that the September Taurid shower indeed exits. On the other hand, small number of observed meteors, small number of analyzed observations and vicinity of large radiants of sporadic meteors connected with northern and southern branches of the apex source made this discovery questionable.

We decided to verify the results described in [1] and [2] using the data from the *Polish Visual Meteor Database (PVMDB)* [3]. Beside of the already published data from 1996-1998 we used also unpublished entries from interval 1999-2000 [4].

2. Observations

We investigated the behavior of the September Taurids in period September 5-25. There are 397.56 hours of effective time of observation and 1906 meteors recorded in *PVMDB* in years 1996-2000 for this interval. These observations were collected by 25 observers whose names with effective times of their observation are listed below:

> Paweł Brewczak (2.00), Dariusz Dorosz (32.66), Ewa Dygos (31.10), Jarosław Dygos (40.92), Tomasz Fajfer (76.50), Izabela Fitoł (5.00), Michał Jurek (6.84), Maciej Kwinta (21.83), Mariusz Lemiecha (16.00), Krzysztof Mularczyk (37.00), Jarosław Noconń (6.22), Arkadiusz Olech (8.50), Dorota Pietruszko (3.41), Łukasz Pospieszny (1.00), Karolina Pyrek (23.00), Andrzej Skoczewski (14.76), Krzysztof Socha (13.63), Dominik Stelmach (5.68), Piotr Szakacz (6.43), Konrad Szaruga (11.24), Paweł Trybus (5.32), Mariusz Wiśniewski (6.94), Albert Witczak (18.08), Luiza Wojciechowska (2.00), Krzysztof Wtorek (1.50)

Basing of this material we obtained 410 hourly rate estimates.

3. Radiant

All meteors from the *PVMDB* were transformed into the `DBF` format and then analyzed using the RADIANT software [4]. This software takes into account the properties of the observed meteors such as angular velocities and coordinates of the beginning and the end of the meteor path and computes the maps of probability for the presence of a radiant (hereafter PPR maps).

We have chosen the maps centered at the radiant of September Taurids and having the size $60^\circ \times 60^\circ$ with resolution of 50×50 pixels. The angular velocity of the meteors taken into consideration was in range $1 - 30^\circ$/s. We have analyzed only these meteors with distance from the center of the map smaller than 90°. The PPR maps were computed for geocentric velocity from 30 to 55 km/s with step equal to 5 km/s and for solar longitude $\lambda_\odot = 172°$ corresponding approximately to September 15. Daily drift of the radiant was assumed to be $\Delta\lambda = 1.0°$.

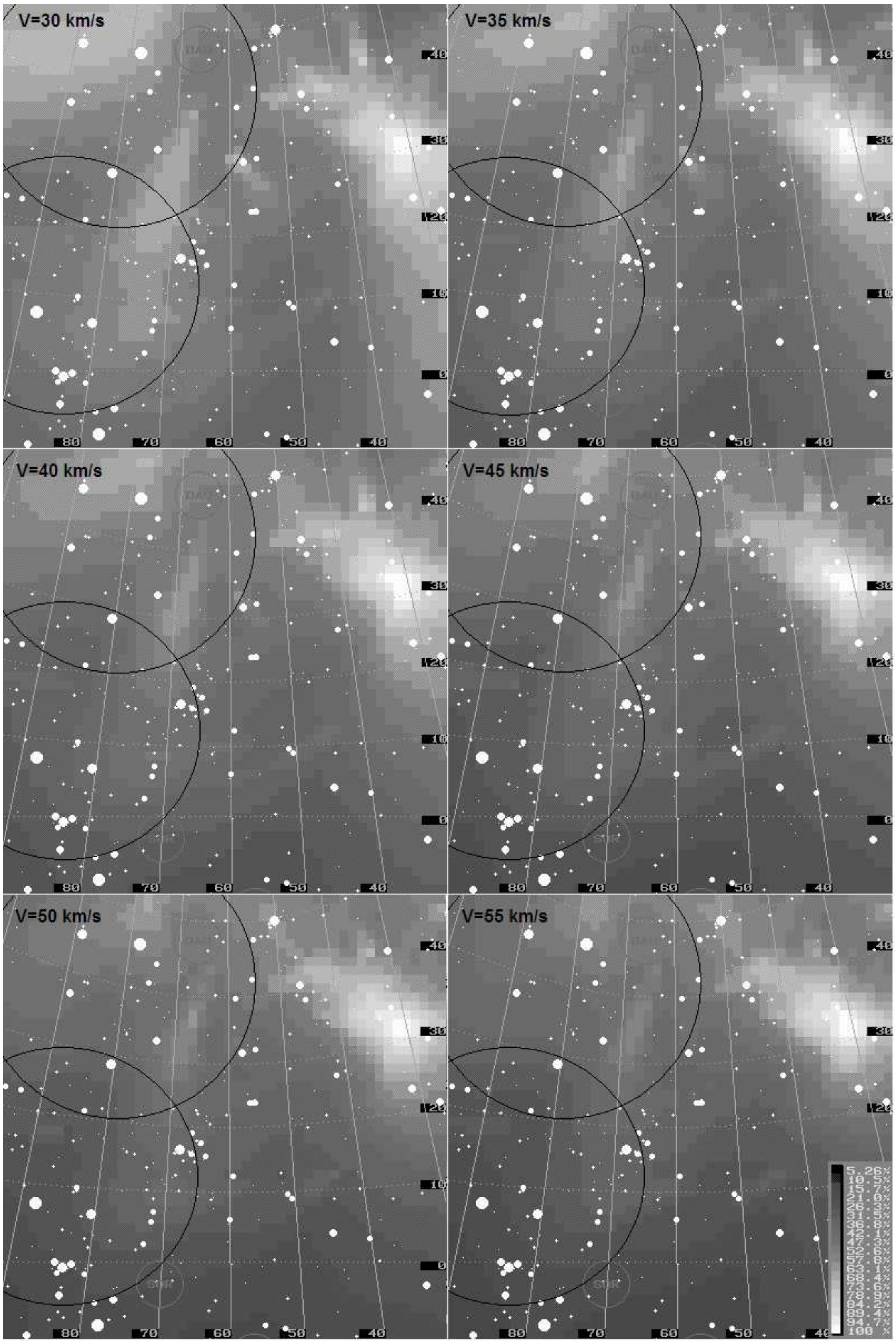

Figure 1 – PPR maps for a sample of 1906 meteor observed around September 15 in years 1996-2000. All maps are computed for the following parameters: $\lambda_\odot = 172°$, $\Delta\lambda = 1.0°$. The maximum distance of the meteor from the radiant is 90°.

The results are presented in Fig. 1 where we show PPR maps for different geocentric velocities. All maps show the position of the other radiants active around September 15 i.e. δ-Aurigids and σ-Orionids.

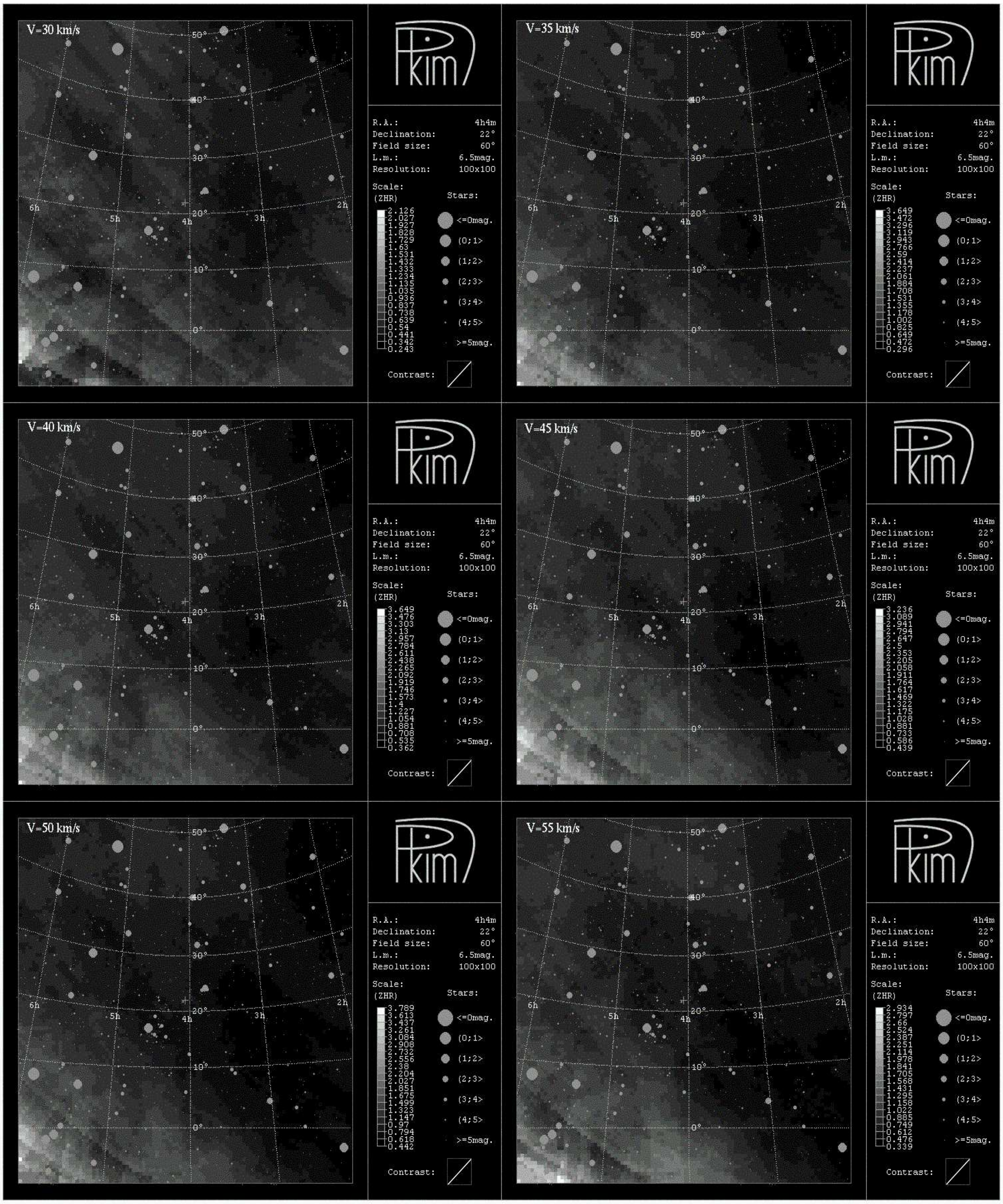

Figure 2 – ZHR maps for a sample of 1906 meteor observed around September 15 in years 1996-2000. All maps are computed for the following parameters: moment of the maximum $\lambda_{\odot} = 172°$, daily drift $\Delta\lambda = 1.0°$.

Since the 1950s we know that sporadic meteor radiants are not distributed uniformly over the celestial sphere, but they are concentrated in particular regions which are similar to radiants with radii around 20° and positions approximately fixed relative to the Sun. The first three sources associated with the ecliptic plane were discovered by Hawkins [5]. According to the latest papers [6,7,8] we now identify six such sources. They are antihelion, helion, northern and southern toroidal centers and also the northern and southern apex. In this work we focus only on apex sources due to the fact that they are relatively close to the suggested position of the September Taurid radiant.

In Fig. 1 northern and southern apex sources are denoted by open circles with radius 20°.

The highest PPR is observed in the border line between Aries and Triangulum constellations and it can be connected with the activity of the α-Triangulid shower [9,10]. One can also detect weak signature of δ-Aurigid radiant, slightly shifted most probably due to the influence of the northern apex source.

There is no signature of any radiant close to the center of the map where we expect to find the radiant of September Taurids.

Recently Olech & Jurek [11] introduced a new ComZHR software which for a given geocentric velocity, computes maps of mean Zenithal Hourly Rates (ZHRs) averaged over a given time interval. The pixels of this map where true radiants exist should have high mean ZHRs comparing to others, making the detection of new showers possible.

We decided to use the ComZHR for looking for the September Taurid radiant. The maps we computed have the same parameters as in case of the analysis performed using the radiant software. Only the resolution was increased to 100×100 pixels. The pixel was considered for analysis only when its altitude during the time of observation was over 20°.

The results obtained using the ComZHR software are shown in Fig. 2.

This time the strongest signature of the radiant is observed in the Orion constellation. It can be combination of two factors: activity of the Southern Apex and high ZHRs produced by low elevation of this part of the map during September nights. Additionally, on all ComZHR maps one can see the same pattern with higher ZHRs at left part of each map. These higher ZHRs are most probably connected with activity of both apex sources.

There is a weak signature of the radiant at the center of the map but its weakness does not allow us to derive any valuable conclusions about its connection with September Taurids.

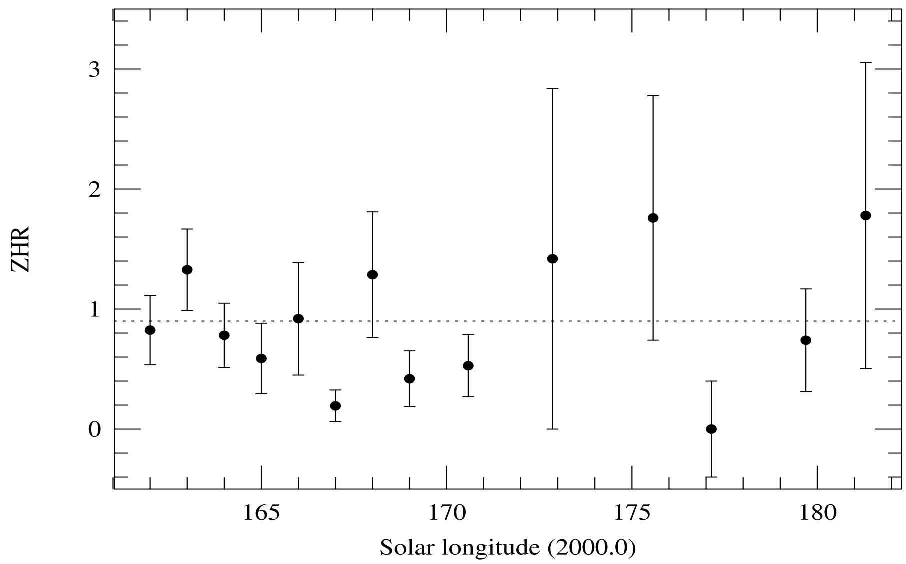

Figure 3 – The activity profile of September Taurids resulting from the *CMW* data. Dotted line denotes mean ZHR value for all points in the graph.

4. Activity profile

Knowing the position of the radiant of September Taurids given in [1,2] we can compute the activity profile of the shower. We assumed that the geocentric velocity and population index r are equal to 40 km/s and 2.6, respectively. The resulting activity profile for September Taurid shower for the period September 5-25 is shown in Fig. 3. There is no any clear trend visible on this graph and one can see only scatter around the mean value of ZHR ≈ 1. The lack of the enhancement of the ZHRs around predicted time of the maximum ($\lambda_\odot \approx 172°$) is another argument for non existence of the September Taurids.

5. Conclusions

Our analysis of paths of 1906 meteors observed in the middle of September 1996-2000 during almost 400 hours collected by Polish *Comets and Meteors Workshop* shows no trace of September Taurids activity. The maps computed by RADIANT and ComZHR software show existence of δ-Aurigids and α-Triangulids radiants but no signature of September Taurids. Also the ZHR profile computed using the radiant position given in [1,2] shows only scatter at the level of ZHR ≈ 1 with no clear enhancement around predicted maximum of the activity of the shower.

Thus we conclude that presently available observational data does not give any proof for the existence of the September Taurid shower. The conclusions about its presence described in [1] and [2] were based on the very modest observational material and were, in our opinion, to eager.

Acknowledgments

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