

THE PREDICTION OF METEOR SHOWERS FROM ALL POTENTIAL PARENT COMETS

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MODELING METEOROID STREAMS

Objective: to map the whole meteor-shower complex of a potential parent body which was formed due to **gravitational action**



Comets in orbits distant from the Earth's orbit

- can associate a stream crossing the Earth's orbit

Comets in orbits close to the Earth's orbit

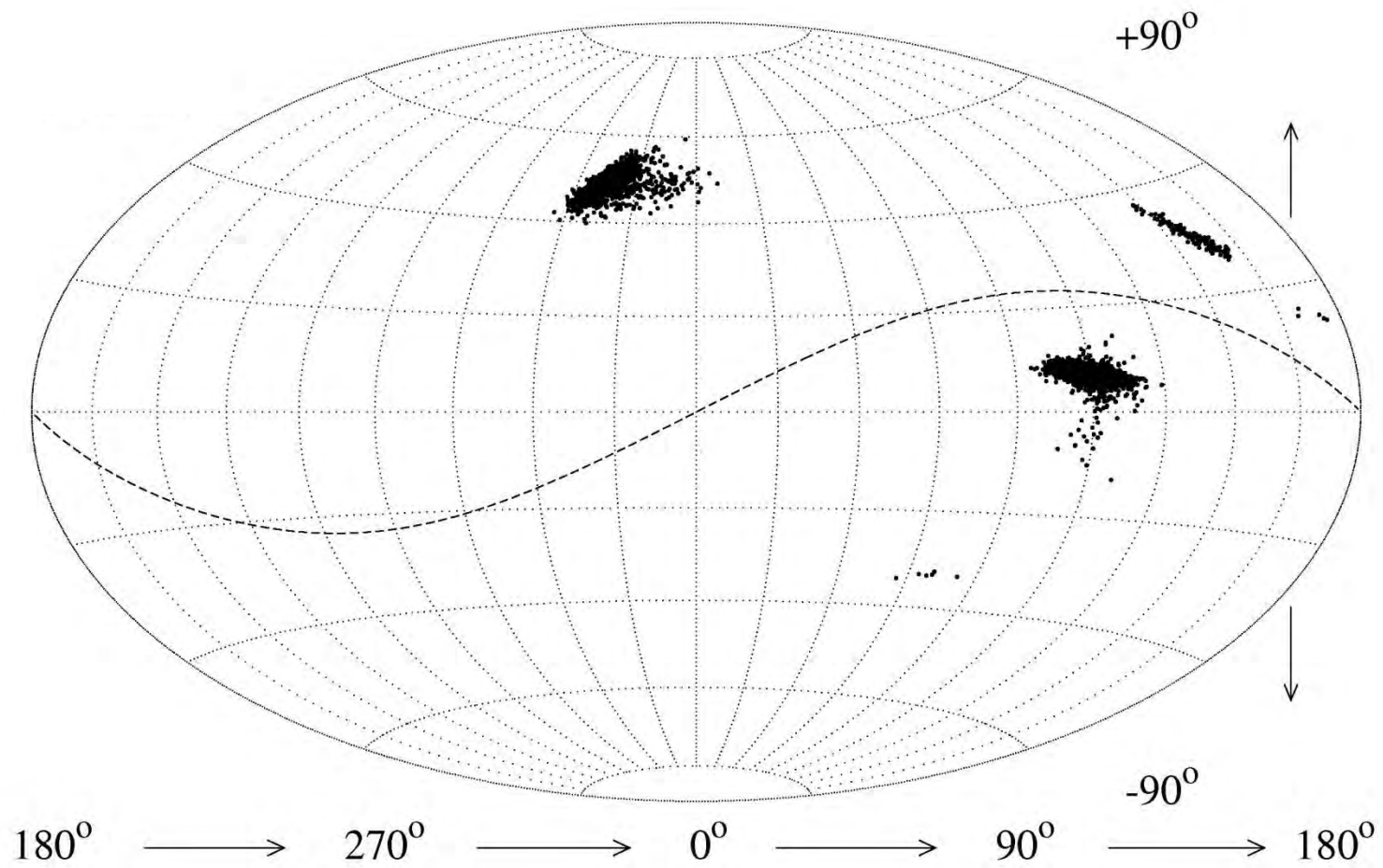
- can associate several meteor showers

RESULTS

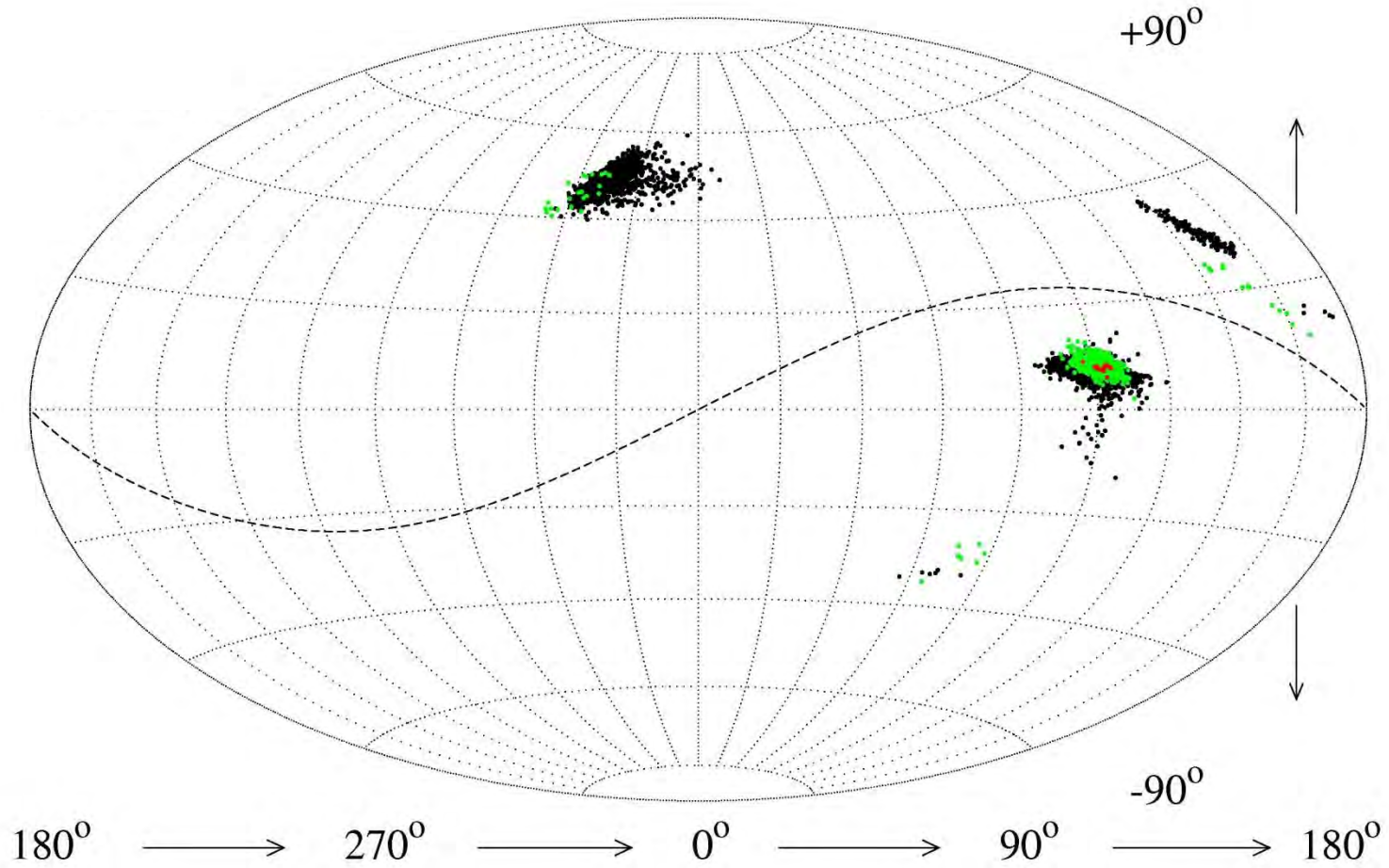
- **New meteor showers** predicted to be observed
- **New parent bodies** associated with known meteor showers suggested

COMET C/1917 F1 MELLISH

LONG-PERIOD COMET C/1917 F1 MELLISH

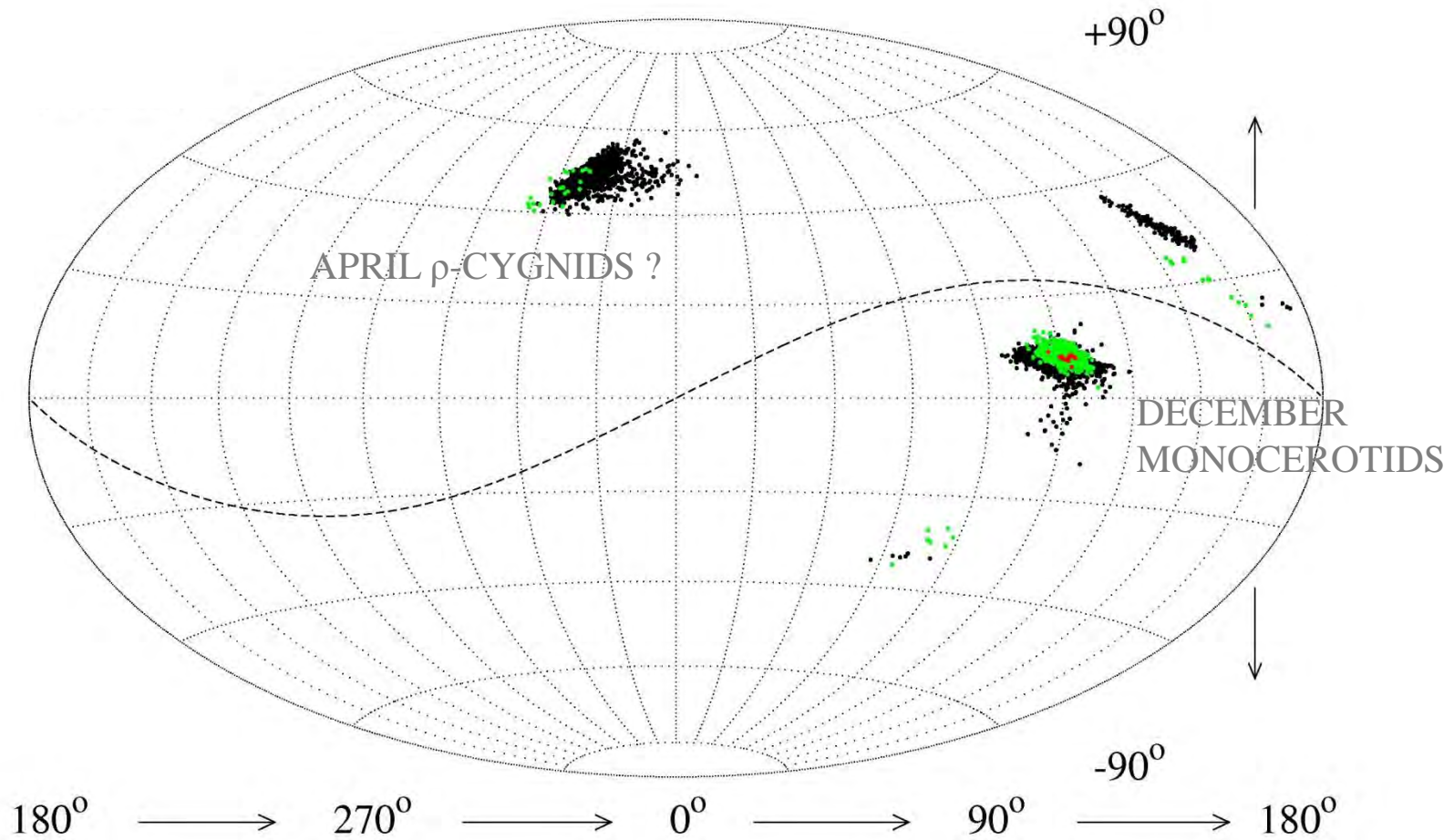


LONG-PERIOD COMET C/1917 F1 MELLISH



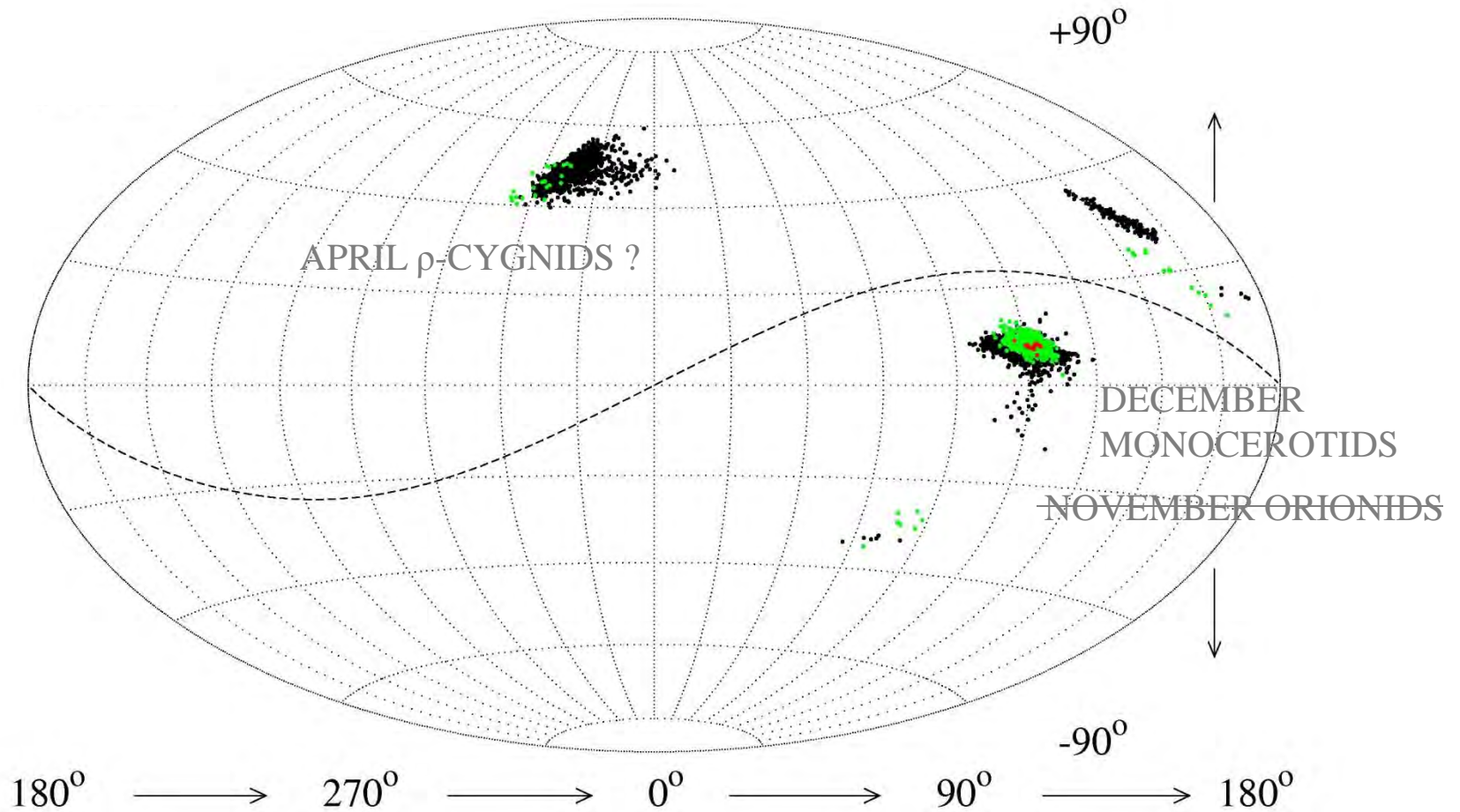
- Video meteors
- Photographic meteors

LONG-PERIOD COMET C/1917 F1 MELLISH



- Video meteors
- Photographic meteors

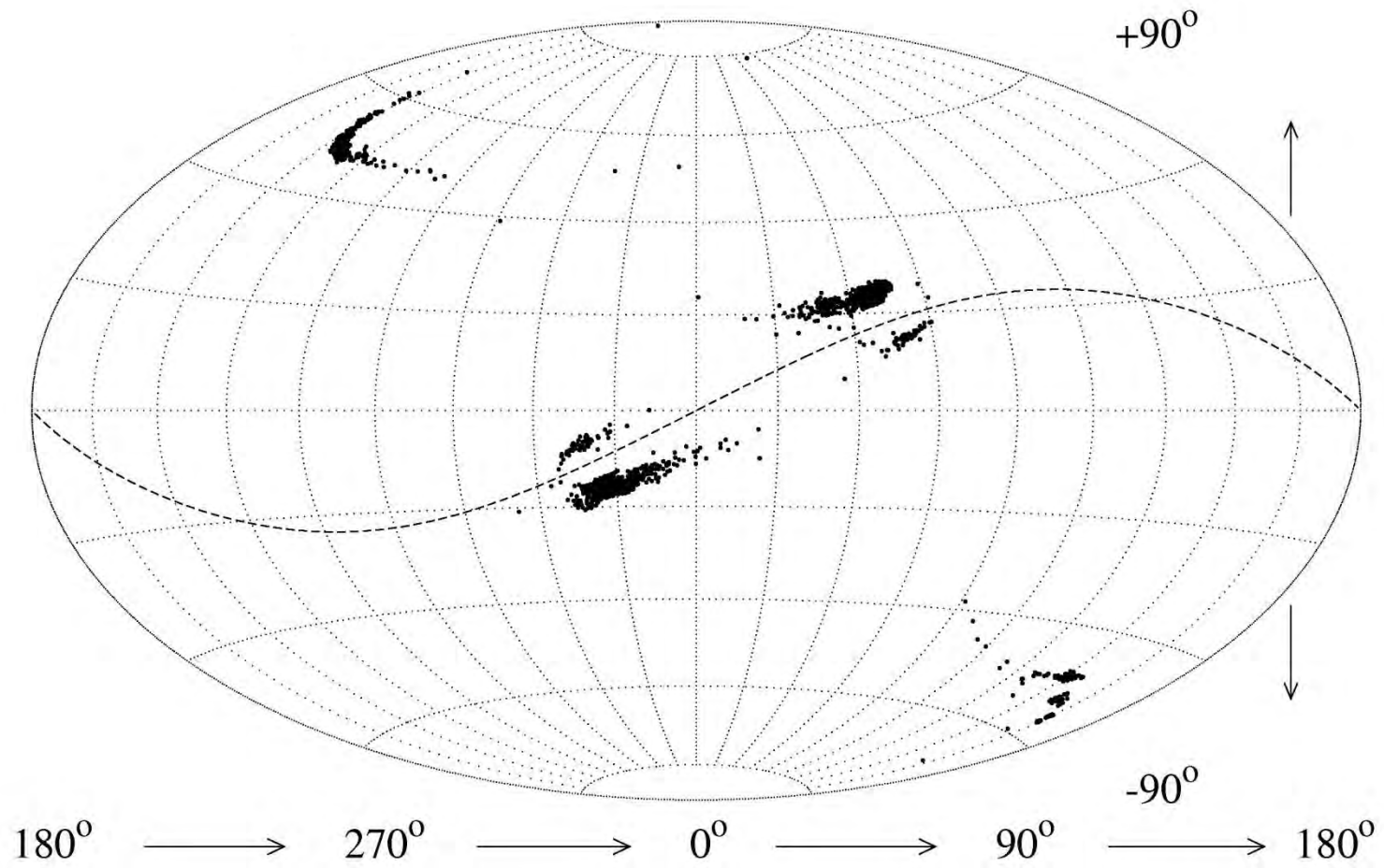
LONG-PERIOD COMET C/1917 F1 MELLISH



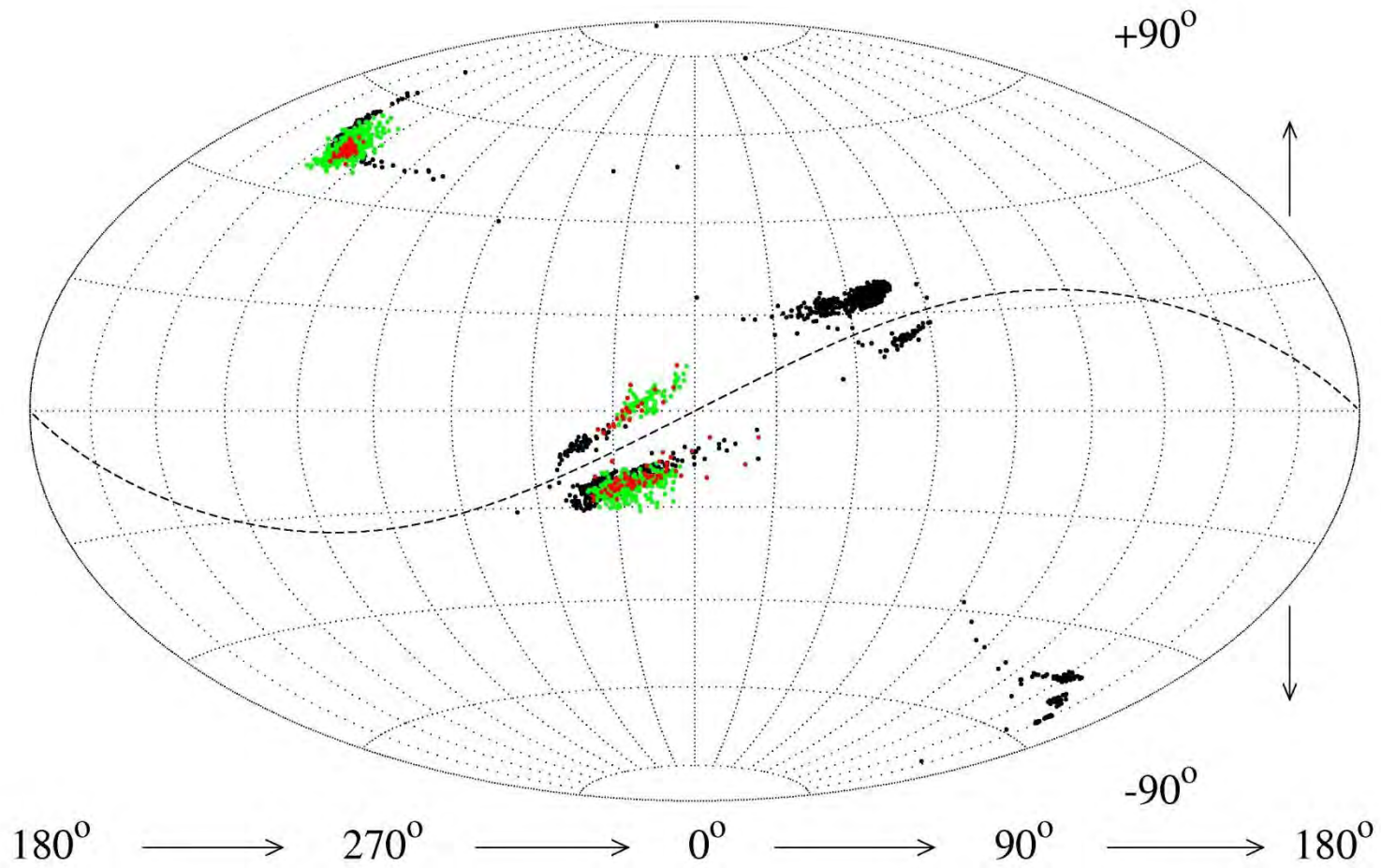
- Video meteors
- Photographic meteors

IDENTICAL METEOR-SHOWER COMPLEXES
COMET 96P/MACHHOLZ
ASTEROID 2003 EH1

COMET 96P/MACHHOLZ

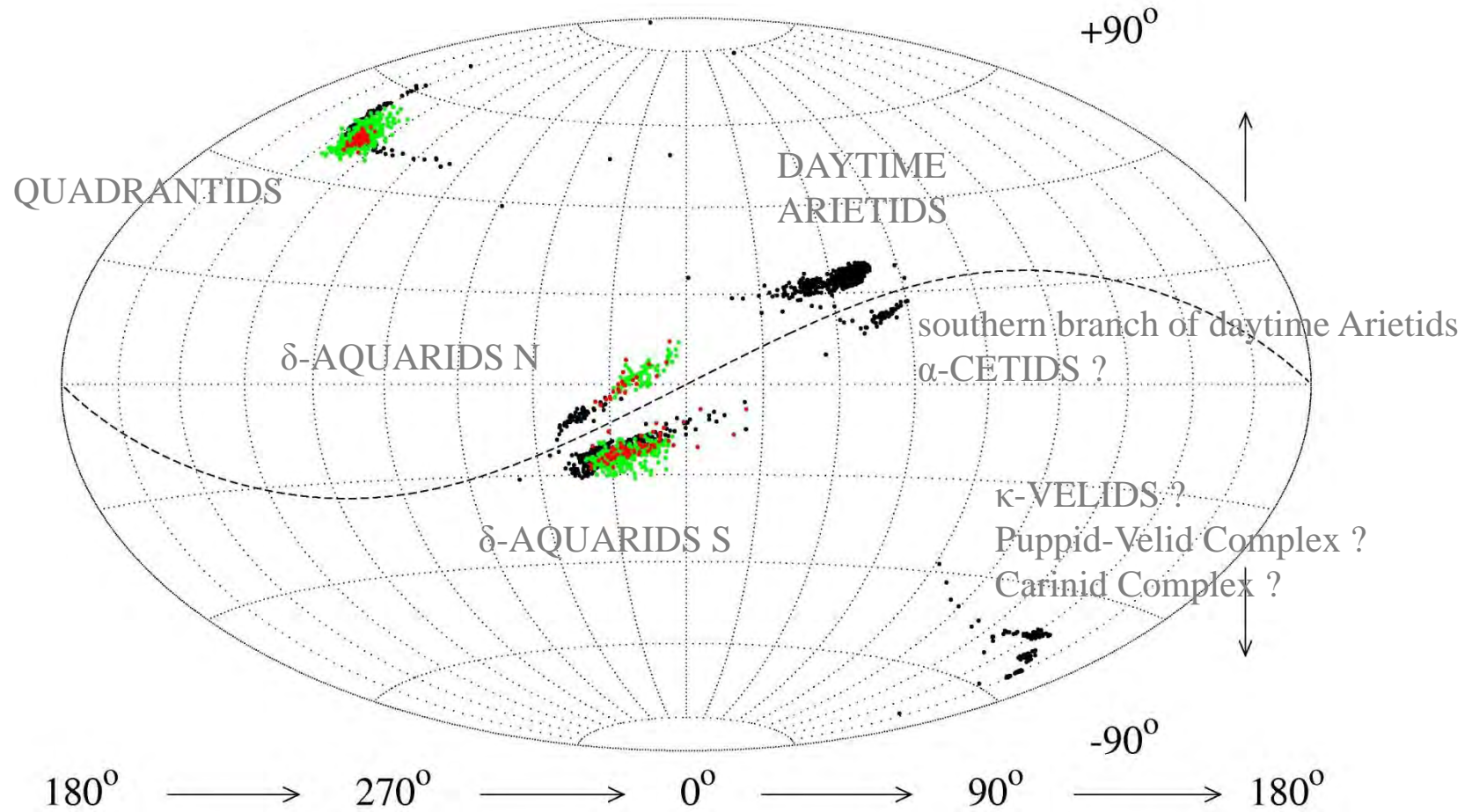


COMET 96P/MACHHOLZ



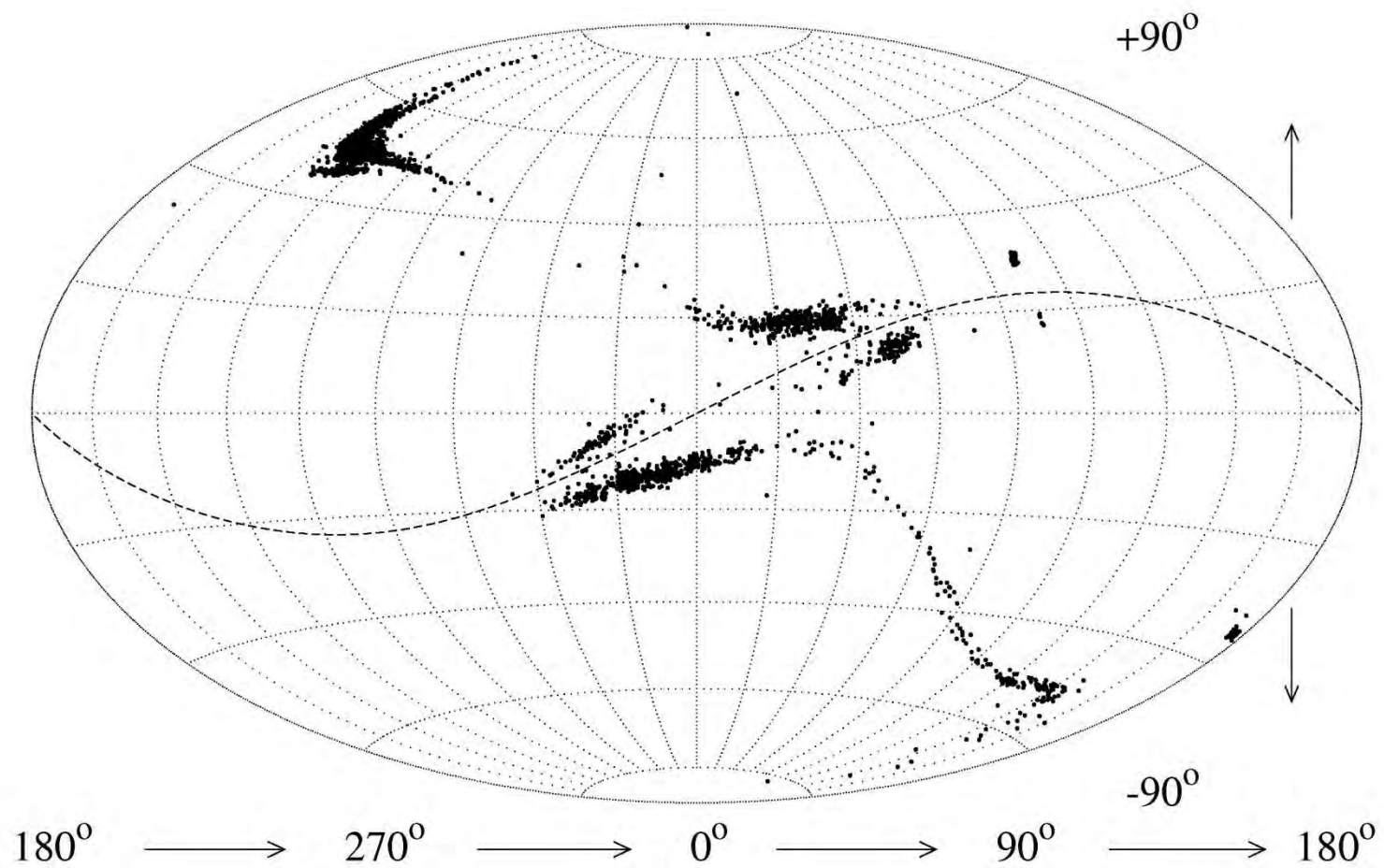
- Video meteors
- Photographic meteors

COMET 96P/MACHHOLZ

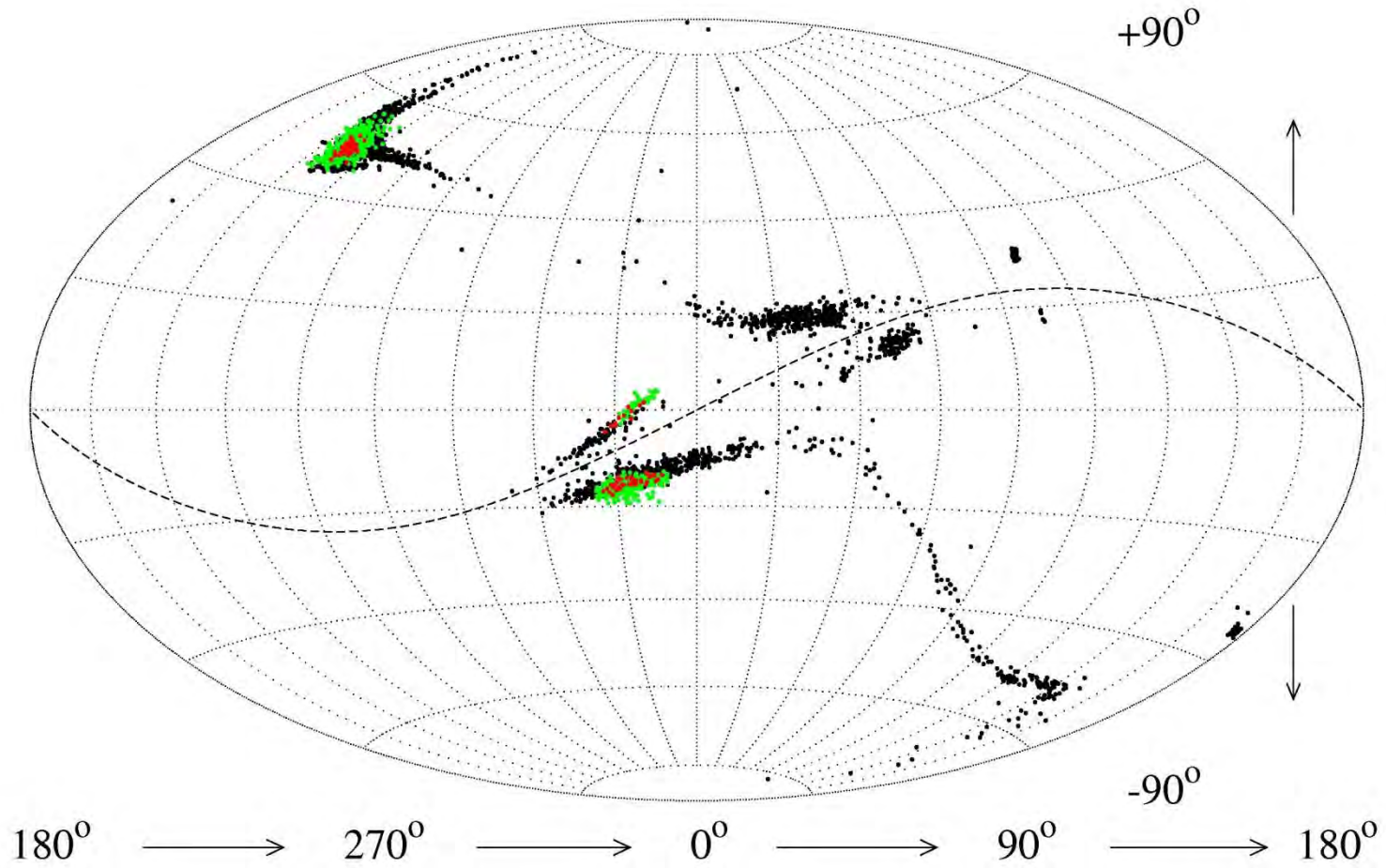


- Video meteors
- Photographic meteors

ASTEROID 2003 EH1

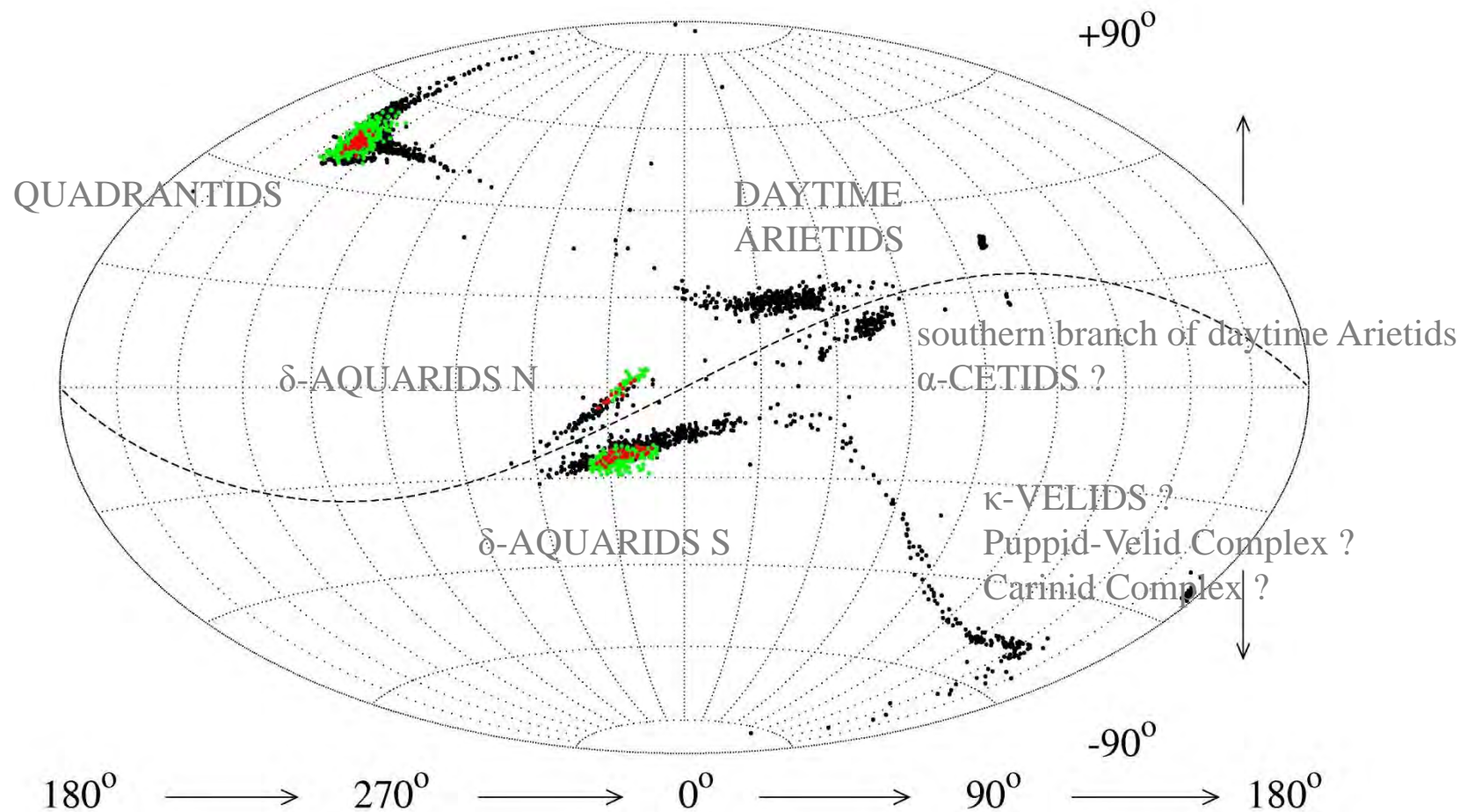


ASTEROID 2003 EH1



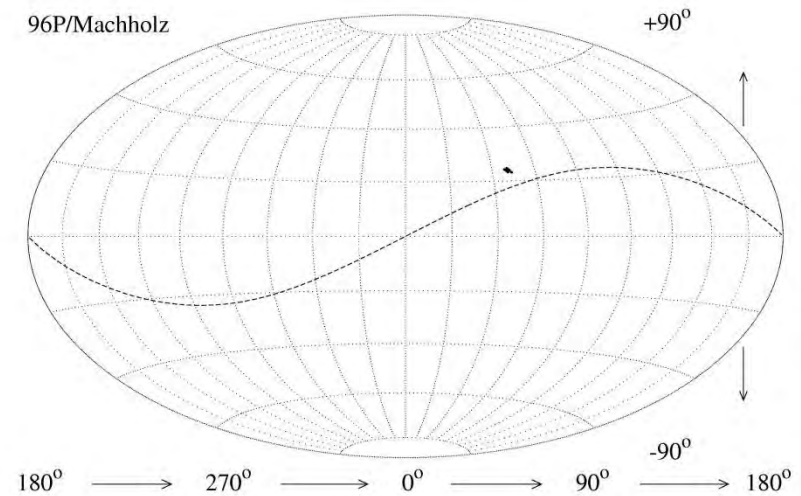
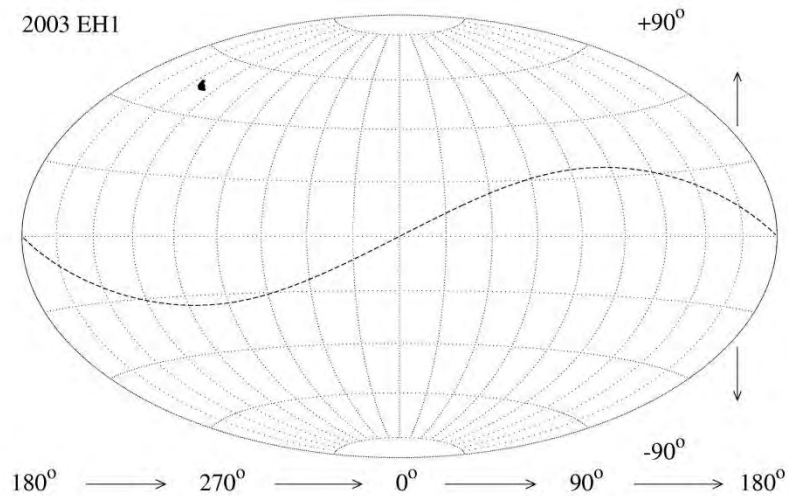
- Video meteors
- Photographic meteors

ASTEROID 2003 EH1



- Video meteors
- Photographic meteors

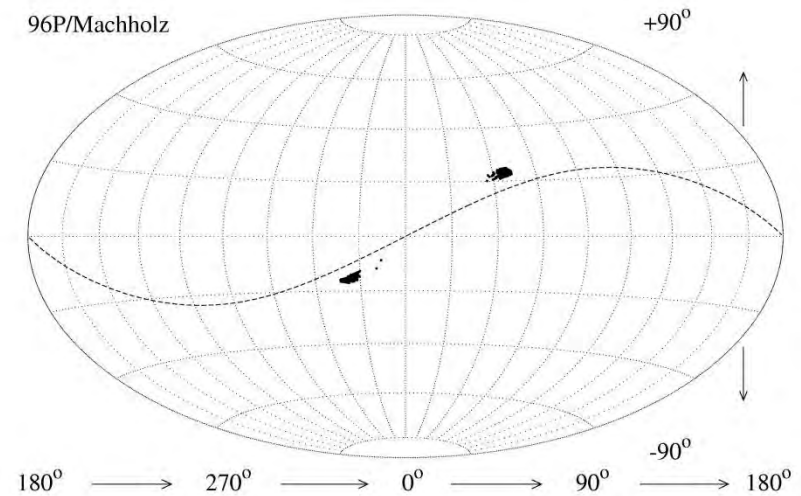
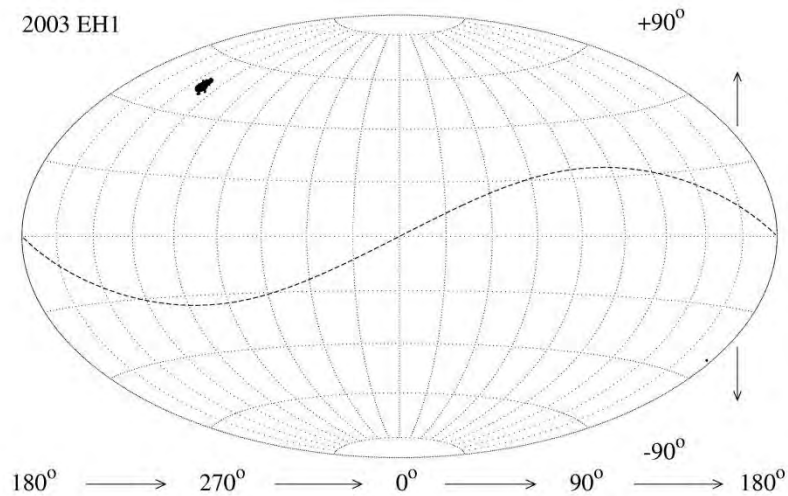
IDENTICAL COMPLEXES



500 years

THE EVOLUTION OF THE METEOR-SHOWER COMPLEXES OF
ASTEROID 2003 EH1 AND **COMET 96P / MACHHOLZ,**
WHICH BECOME, AFTER SUFFICIENT TIME, NEARLY IDENTICAL

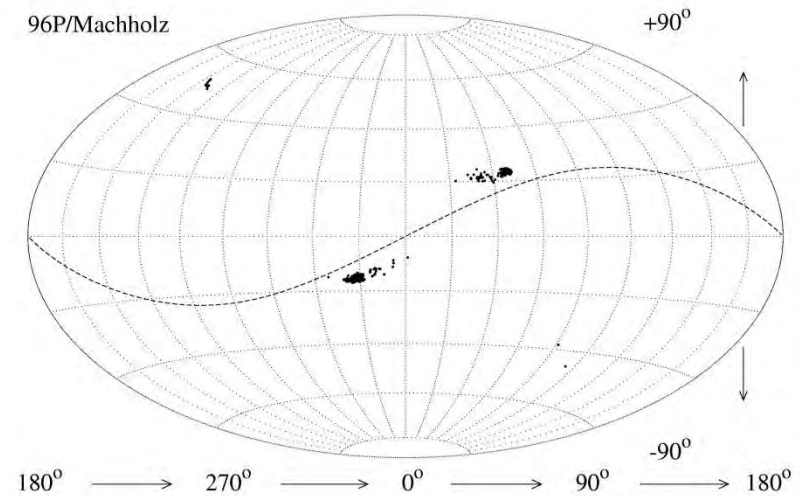
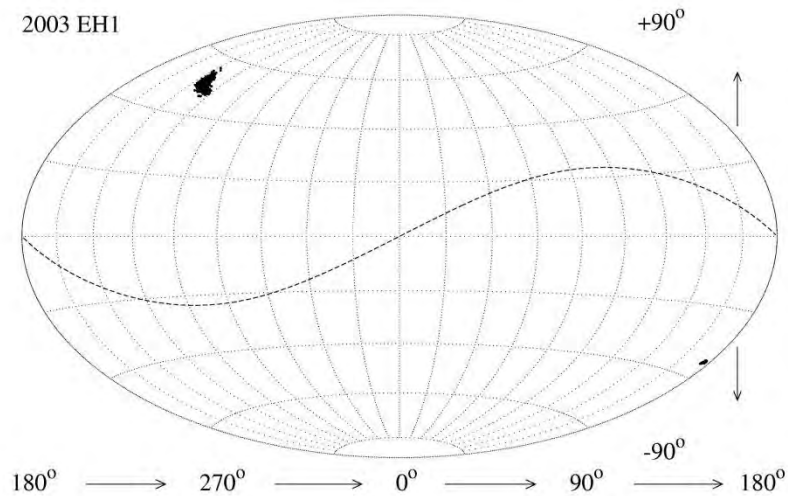
IDENTICAL COMPLEXES



1000 years

THE EVOLUTION OF THE METEOR-SHOWER COMPLEXES OF
ASTEROID 2003 EH1 AND **COMET 96P / MACHHOLZ,**
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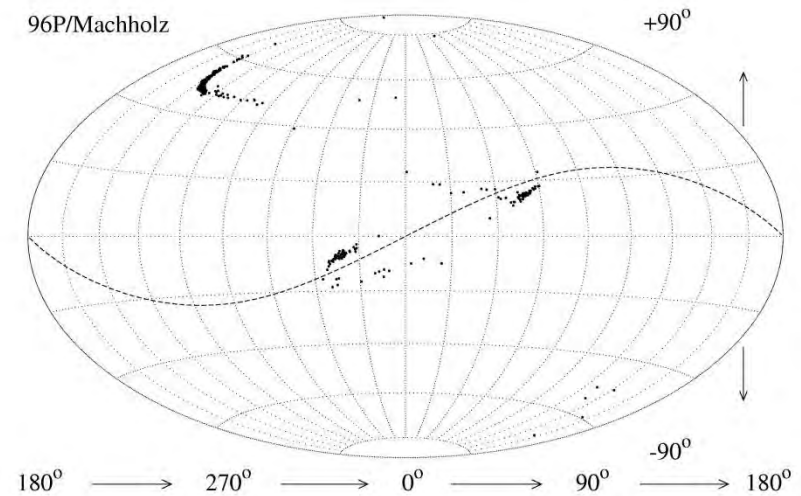
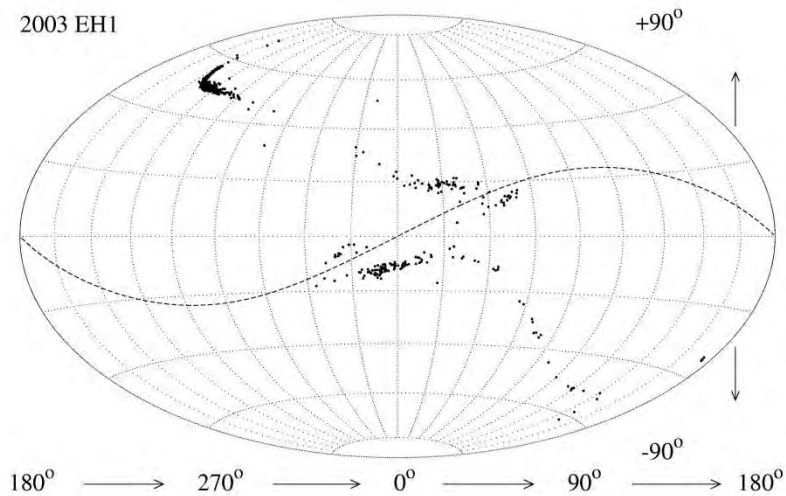
IDENTICAL COMPLEXES



2000 years

THE EVOLUTION OF THE METEOR-SHOWER COMPLEXES OF
ASTEROID 2003 EH1 AND **COMET 96P / MACHHOLZ,**
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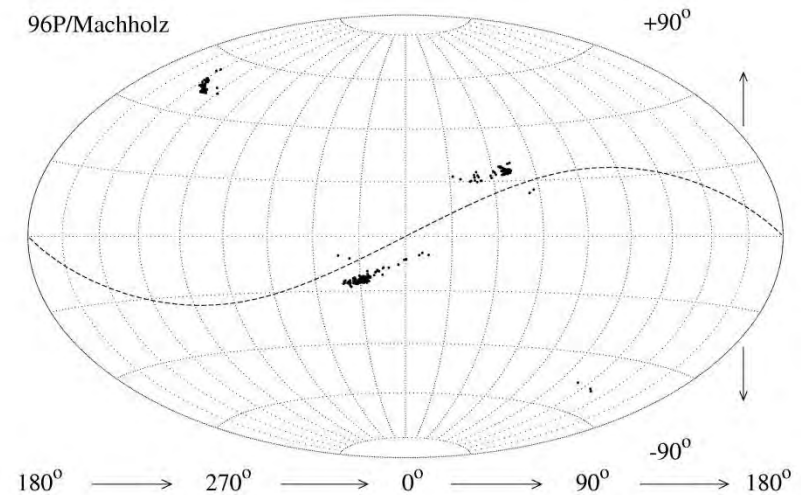
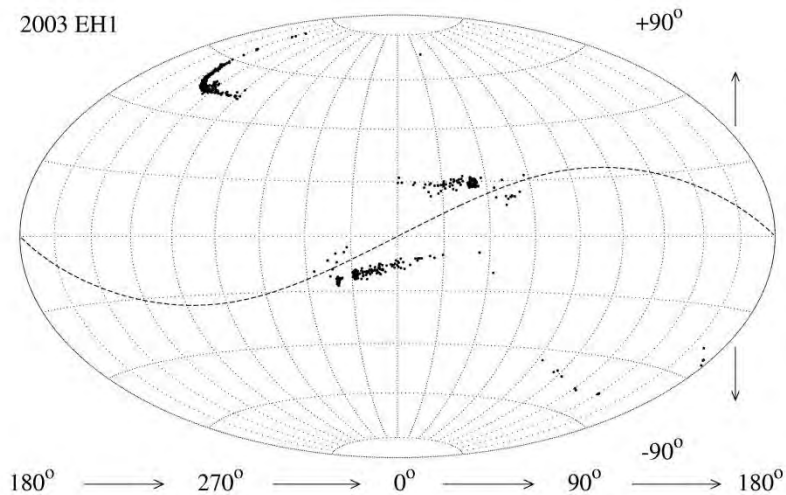
IDENTICAL COMPLEXES



2900 years

THE EVOLUTION OF THE METEOR-SHOWER COMPLEXES OF
ASTEROID 2003 EH1 AND **COMET 96P / MACHHOLZ,**
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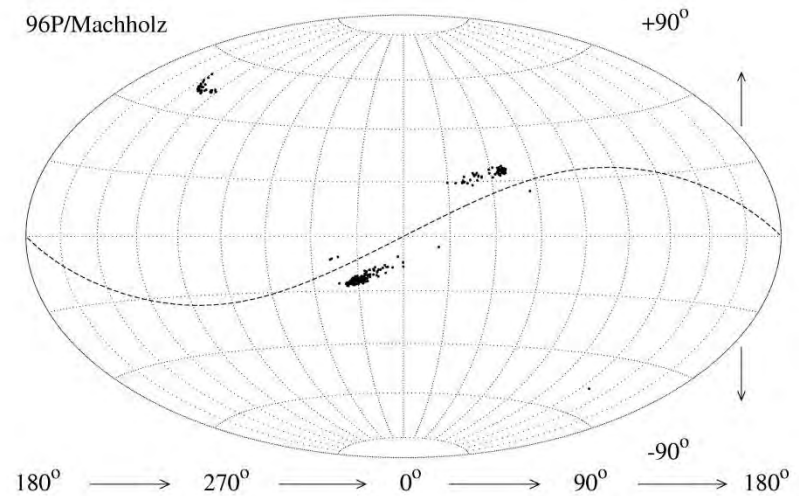
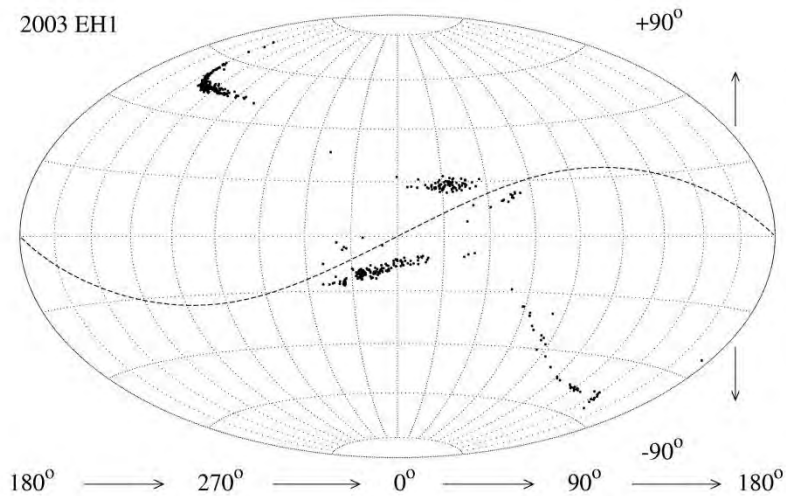
IDENTICAL COMPLEXES



3000 years

THE EVOLUTION OF THE METEOR-SHOWER COMPLEXES OF
ASTEROID 2003 EH1 AND **COMET 96P / MACHHOLZ,**
WHICH BECOME, AFTER SUFFICIENT TIME, NEARLY IDENTICAL

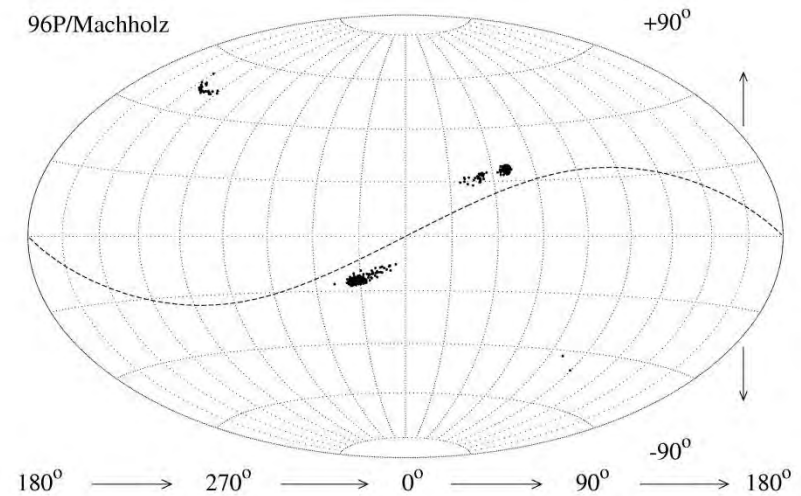
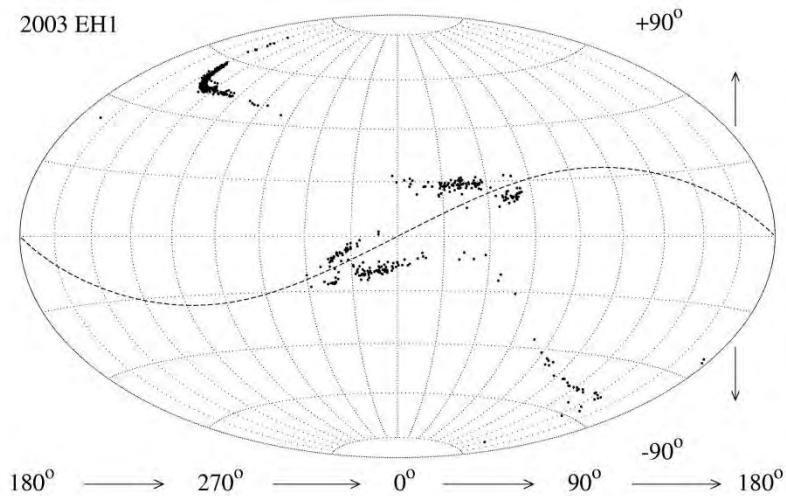
IDENTICAL COMPLEXES



3100 years

THE EVOLUTION OF THE METEOR-SHOWER COMPLEXES OF
ASTEROID 2003 EH1 AND **COMET 96P / MACHHOLZ,**
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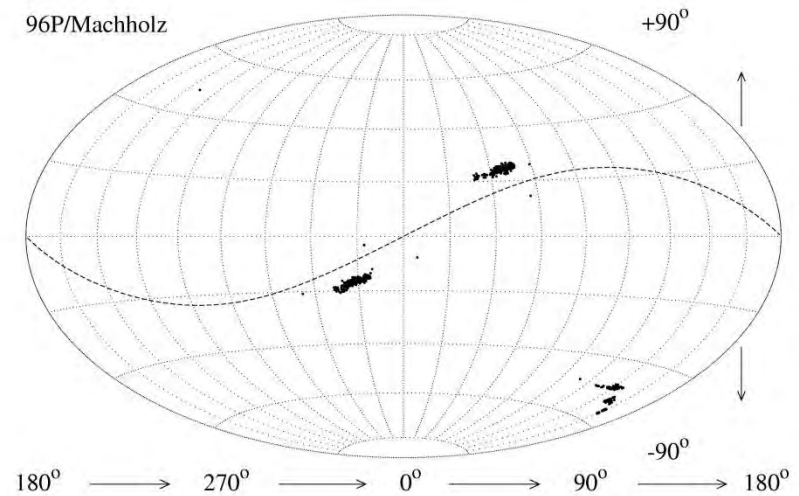
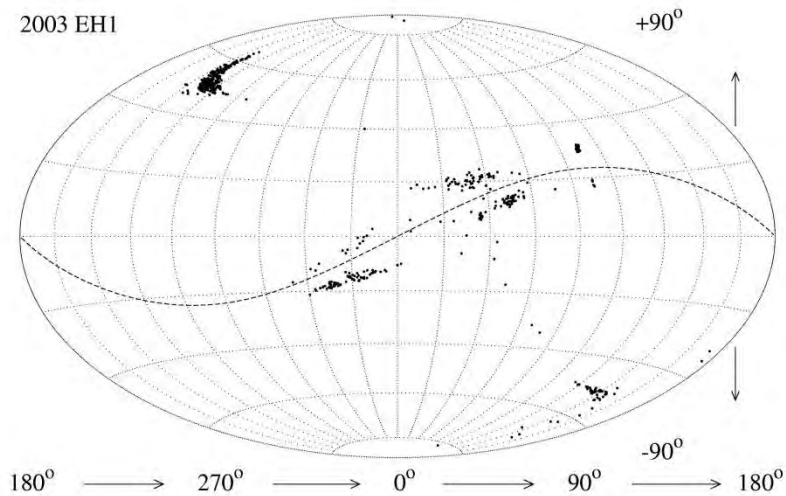
IDENTICAL COMPLEXES



3200 years

THE EVOLUTION OF THE METEOR-SHOWER COMPLEXES OF
ASTEROID 2003 EH1 AND **COMET 96P / MACHHOLZ,**
WHICH BECOME, AFTER SUFFICIENT TIME, NEARLY IDENTICAL

IDENTICAL COMPLEXES

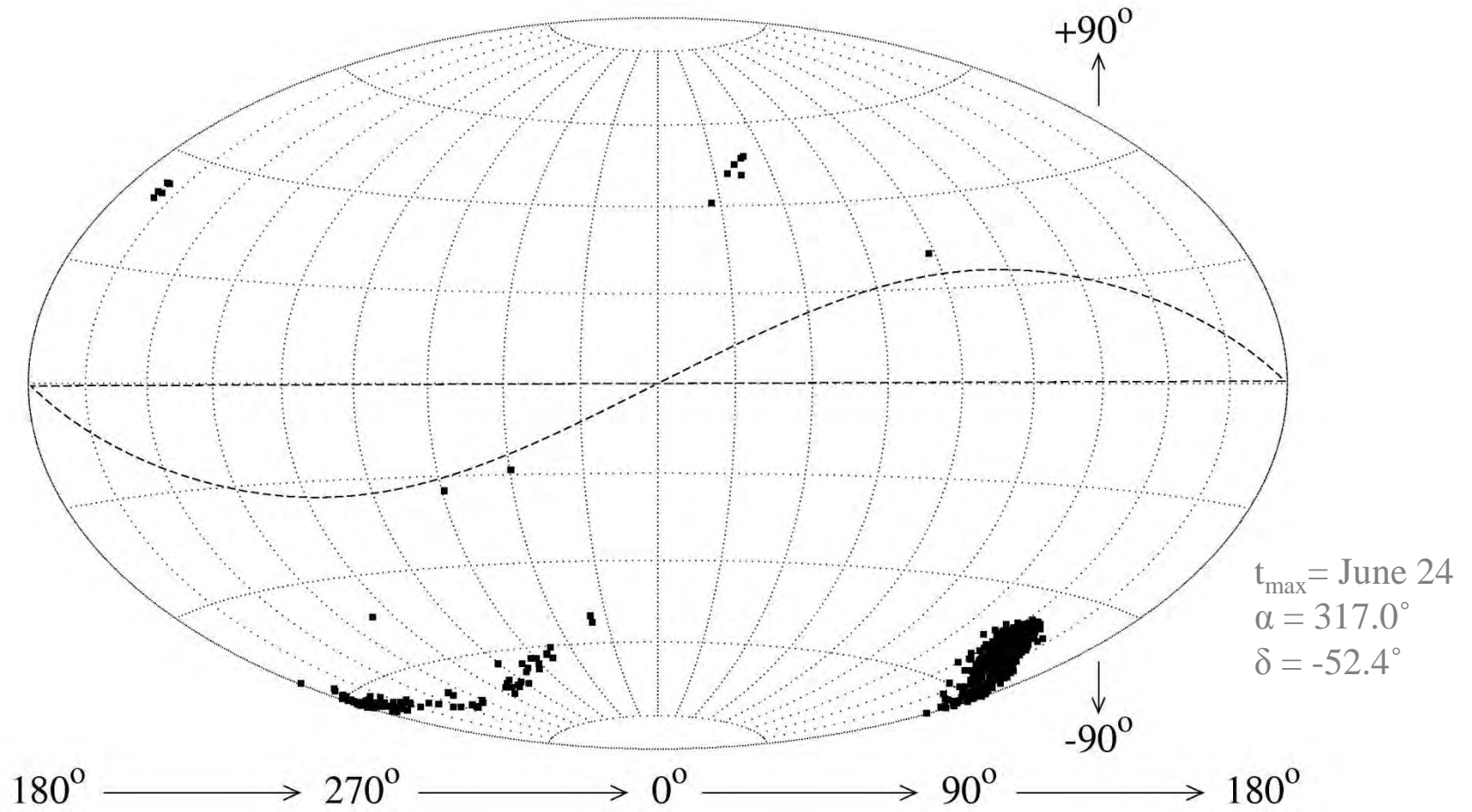


4000 years

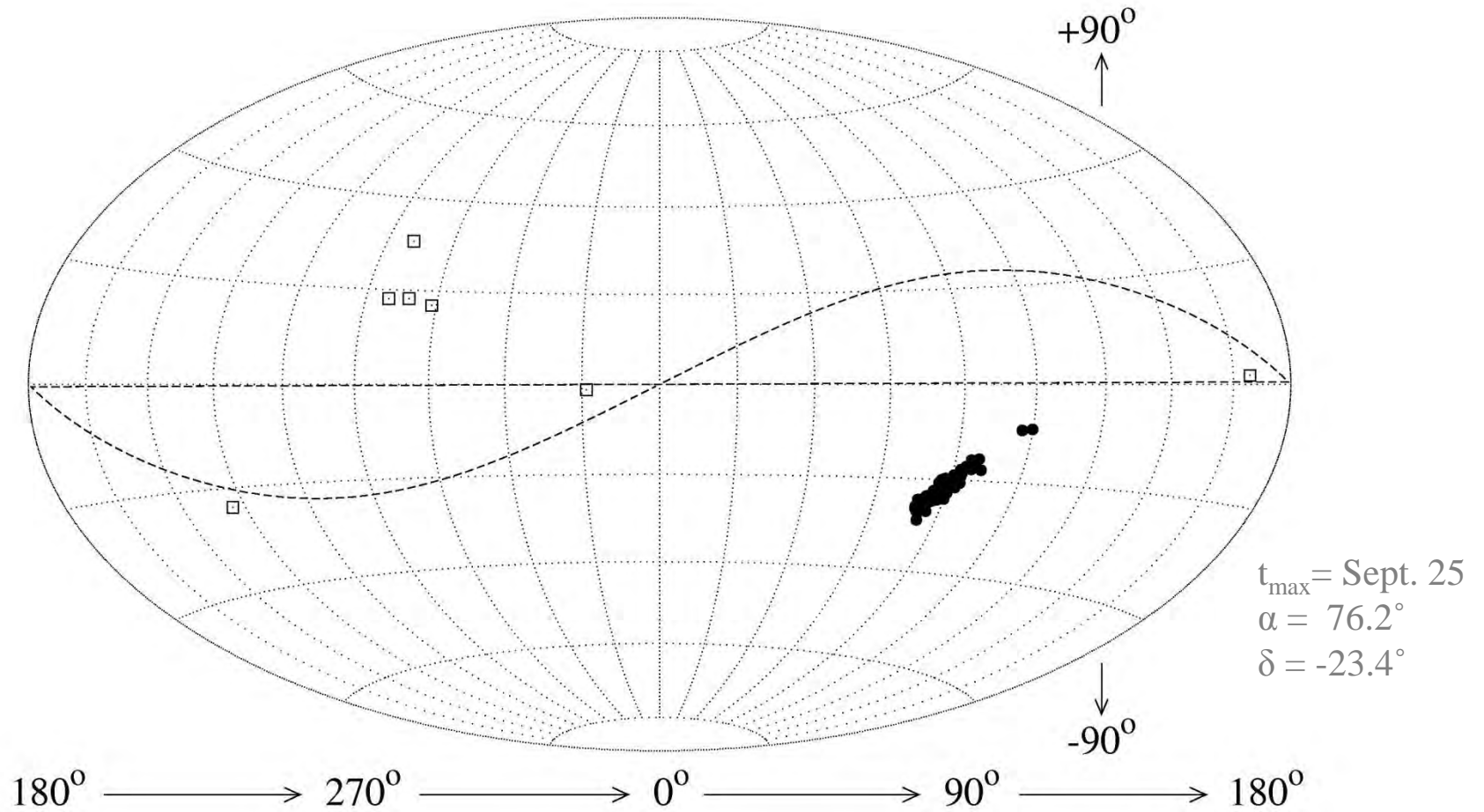
THE EVOLUTION OF THE METEOR-SHOWER COMPLEXES OF
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WHICH BECOME, AFTER SUFFICIENT TIME, NEARLY IDENTICAL

**NEW METEOR SHOWERS
IN THE SOUTHERN HEMISPHERE
PREDICTED**

122P/DE VICO

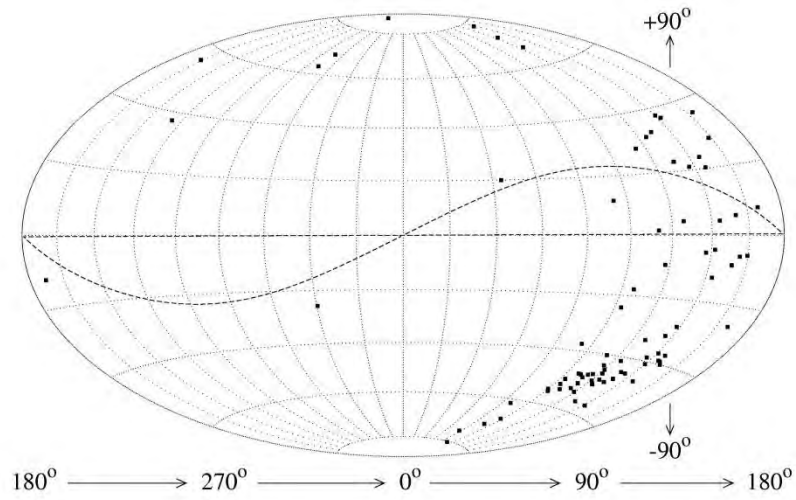


161P/HARTLEY-IRAS

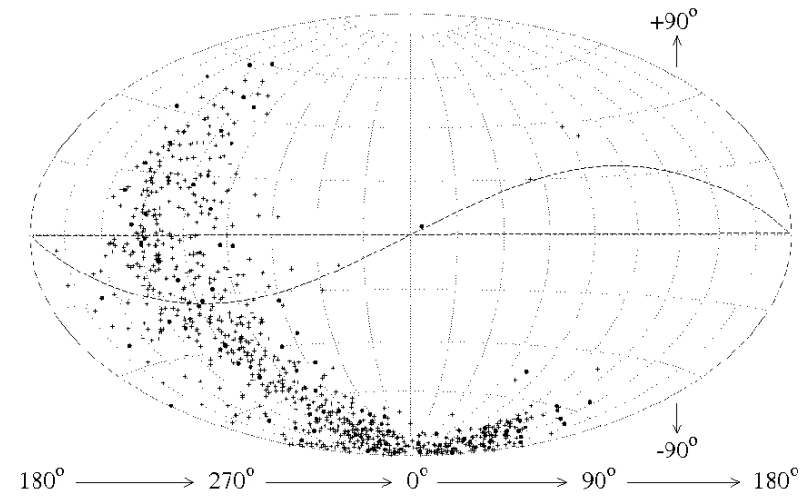


**MODELED STREAMS WITH
DISPERSED RADIANTS**

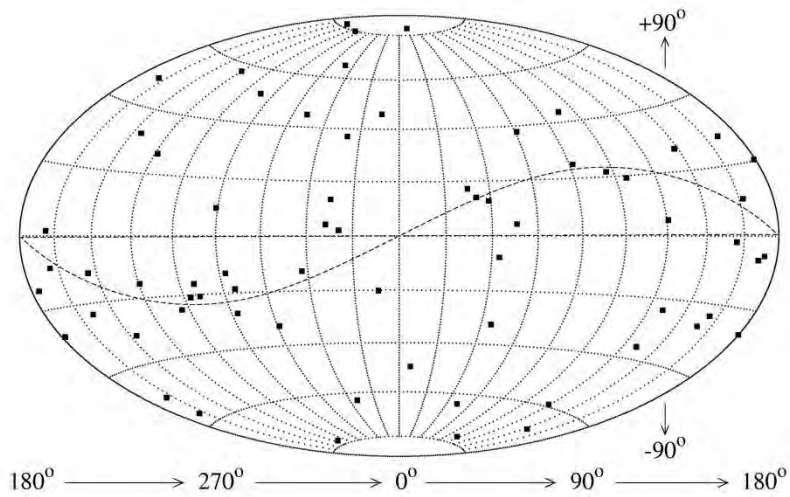
80P/PETERS-HARTLEY



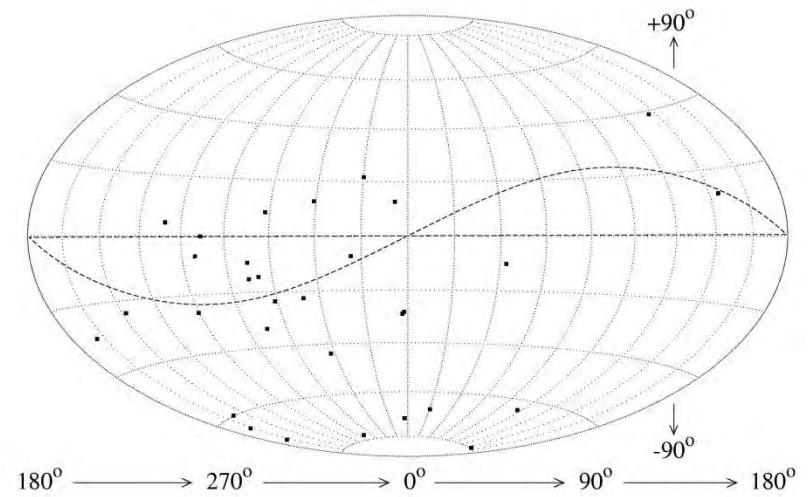
126P/IRAS



102P/SHOEMAKER 1



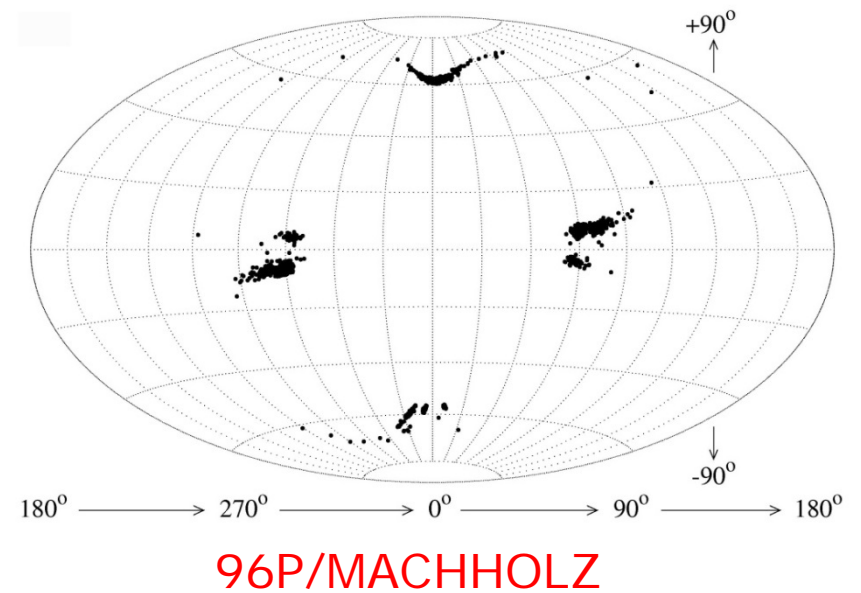
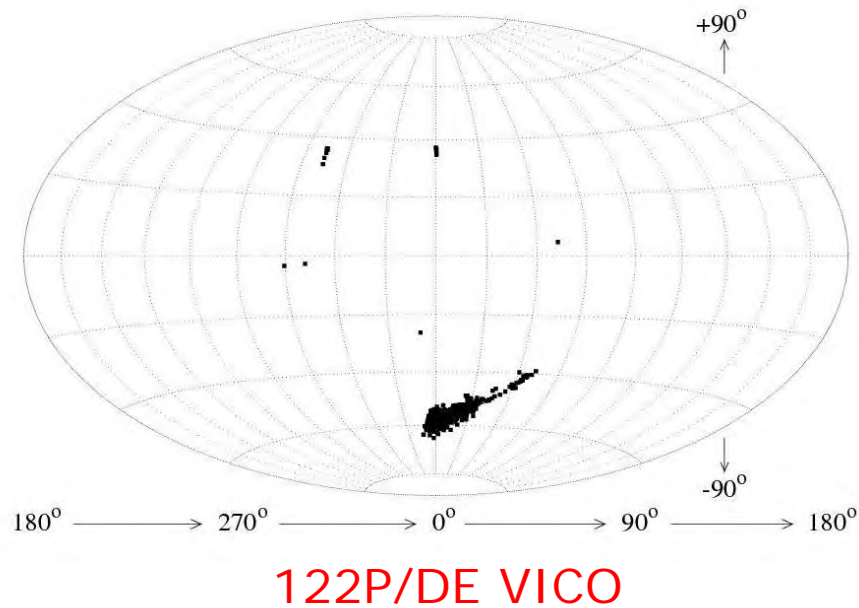
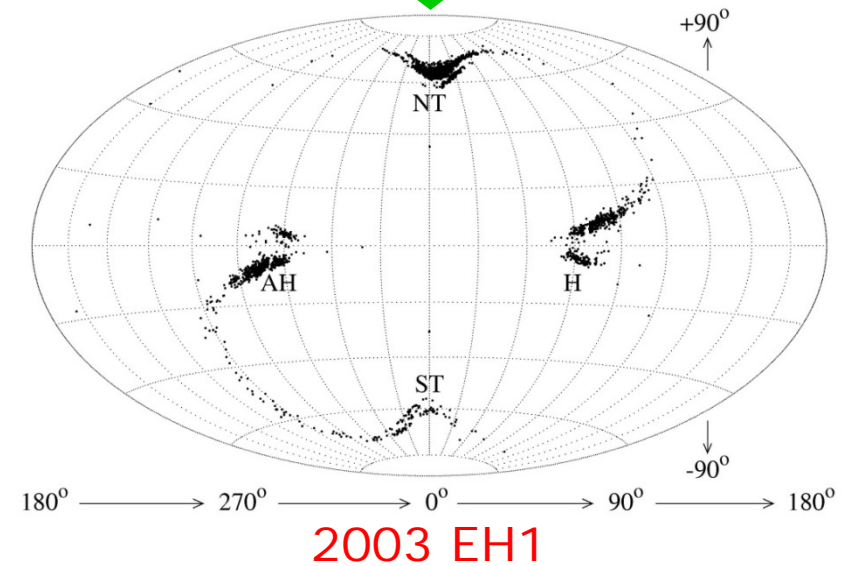
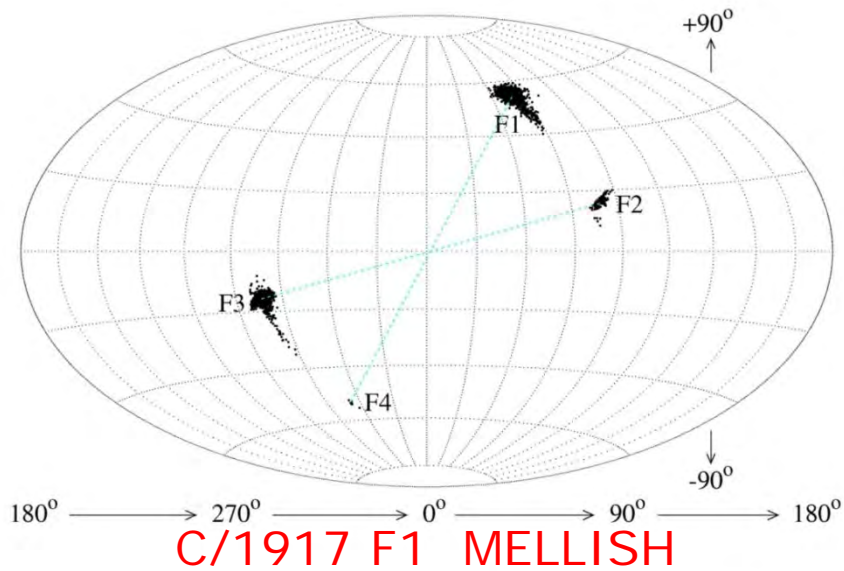
149P/MUELLER 4



SYMMETRY ON THE SKY

SYMMETRY WITH RESPECT TO THE EARTH'S APEX

ECLIPTIC-TOROIDAL STRUCTURE



CONCLUSIONS

- a single parent body can associate multiple showers
- a shower can be associated to multiple parent bodies
- shower radiants of a complex are distributed on the sky symmetrically with respect to the Earth's apex
- ecliptic-toroidal structure of complexes was found

PROJECT OF THE PREDICTION OF METEOR SHOWERS FROM ALL POTENTIAL PARENT COMETS

▪ Team of the Astronomical Institute of the Slovak academy of sciences

Comets 14P/Wolf and D/1892 T1 as parent bodies of a common, α -Capricornids related, meteor stream.

L. Neslušan (1999), A&A 351, 752

The parent bodies of the Quadrantid meteoroid stream.

Z. Kaňuchová and L. Neslušan (2007), A&A 470, 1123

Search for New Parent Bodies of Meteoroid Streams Among Comets. I. Showers of Comets 126P/1996 P1 and 161P/2004 V2 with Radiants on Southern Sky.

D. Tomko and L. Neslušan (2012), EM&P 108, 123

Prediction of meteor shower associated with Comet 122P/de Vico.

D. Tomko (2014), CAOSP 44, 33

The meteor-shower complex of 96P/Machholz revisited.

L. Neslušan, Z. Kaňuchová, and D. Tomko (2013), A&A 551, 14

Meteor-shower complex of asteroid 2003 EH1 compared with that of comet 96P/Machholz.

L. Neslušan, M. Hajduková, jr., and M. Jakubík (2013), A&A 560, A47

The meteor-shower complex of comet C/1917 (Mellish).

L. Neslušan and M. Hajduková, jr. (2014), A&A, 566, A33

Ecliptic-toroidal structure of the meteor complex.

Neslušan, L., Kaňuchová, Z., and Tomko, D. (2014), in Proceedings of the Astronomical Conference held at A. M. University, Poznan, Poland, 235–242

Prediction of meteor shower of comet 161P/2004 V2.

Tomko, D. and Neslušan, L. (2014), in Proceedings of the Astronomical Conference held at A. M. University, Poznan, Poland, 243–249