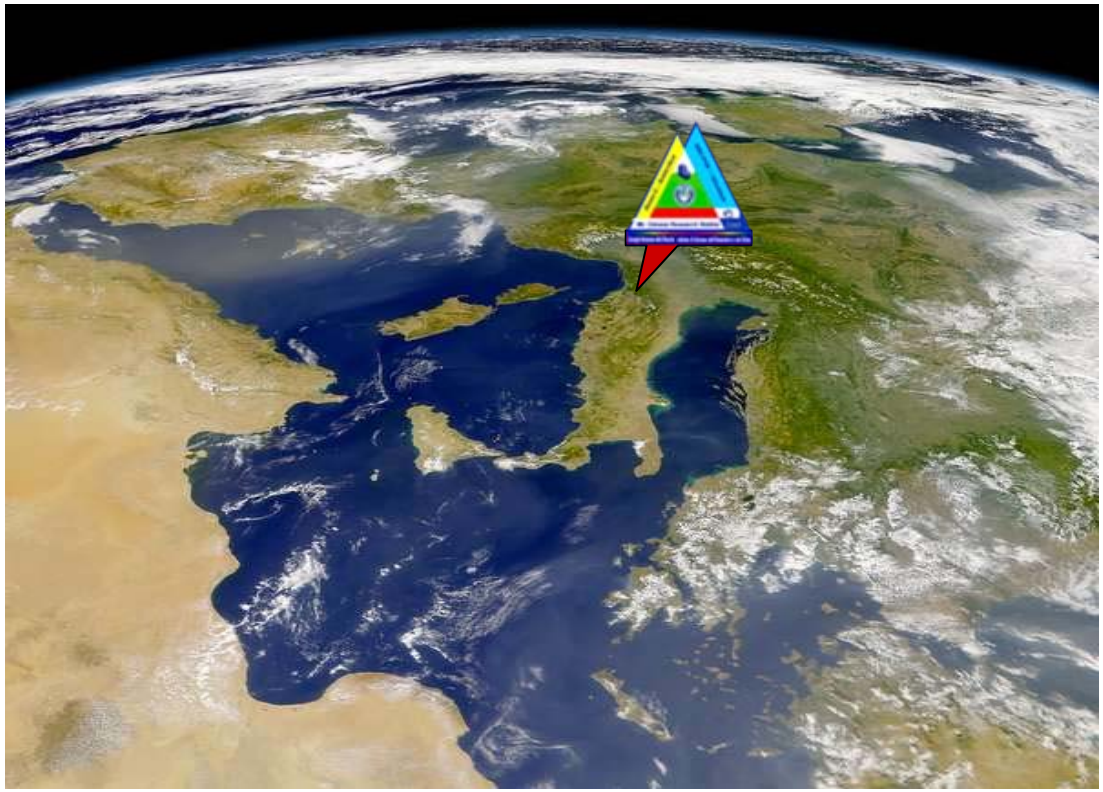
Identifying and Quantifying Sources of Halogenated Greenhouse Gases Using Lagrangian Dispersion Methods



M. Maione and J. Arduini. *Inst. of Chemical Sciences*
L. Belfiore, F. Furlani, and U. Giostra. *Inst. of Physics*
University of Urbino, ITALY

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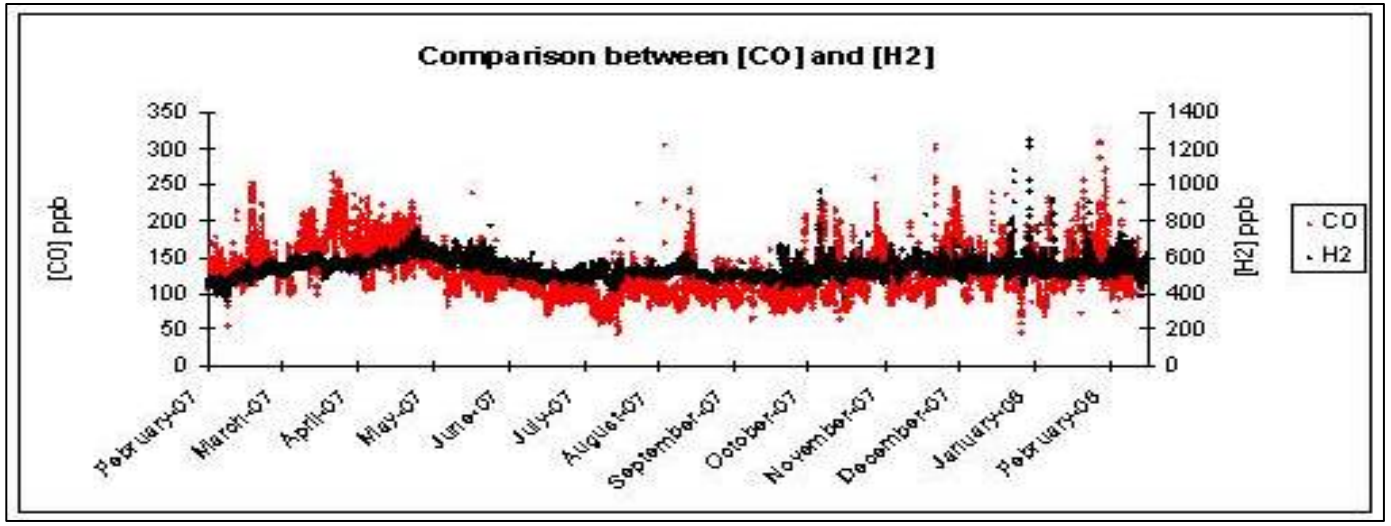
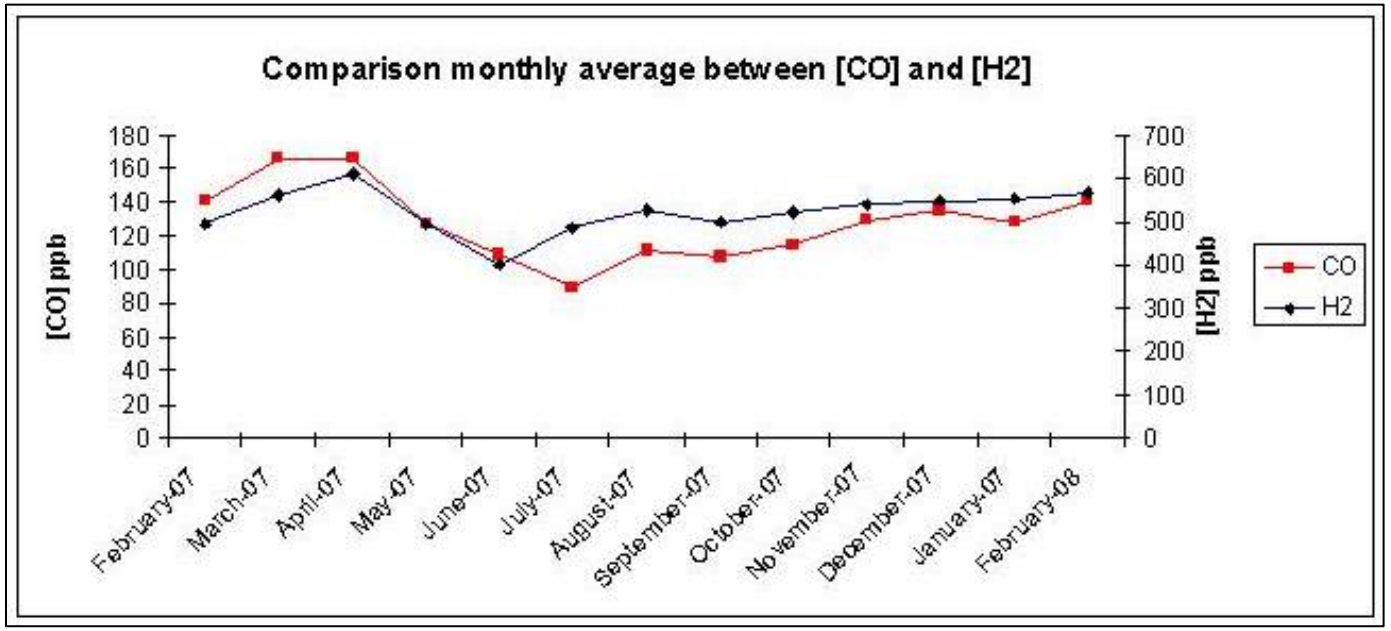
Mt. Cimone GAW-WMO Regional Station
Lat. 44.11 N, Lon. 10. 42 E, 2165 m asl

H_2 and CO Measurements





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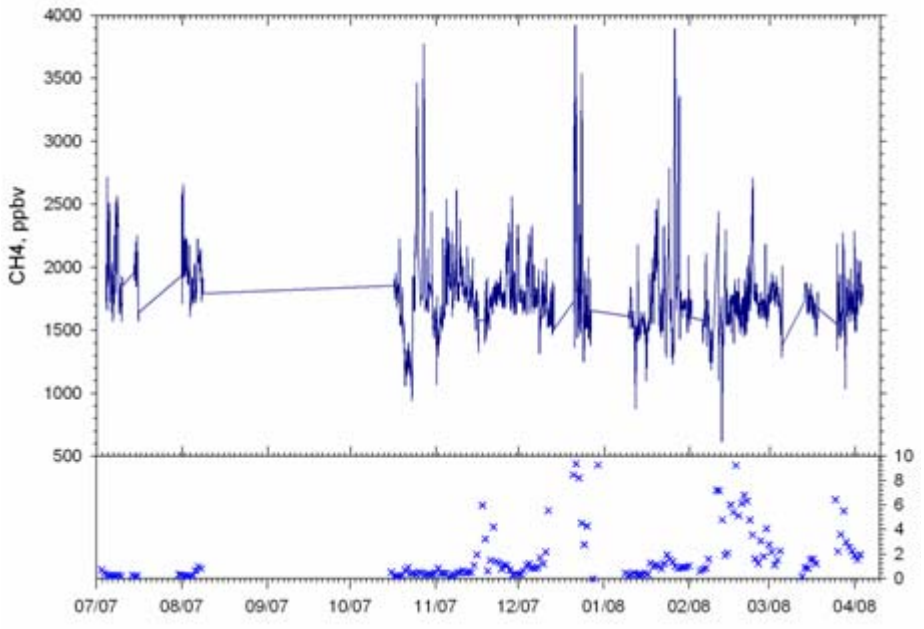
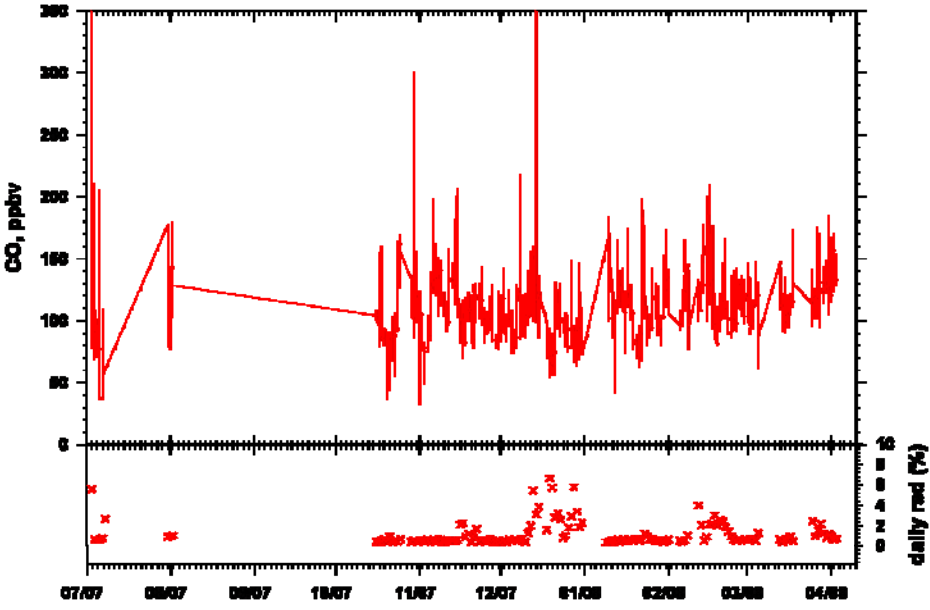
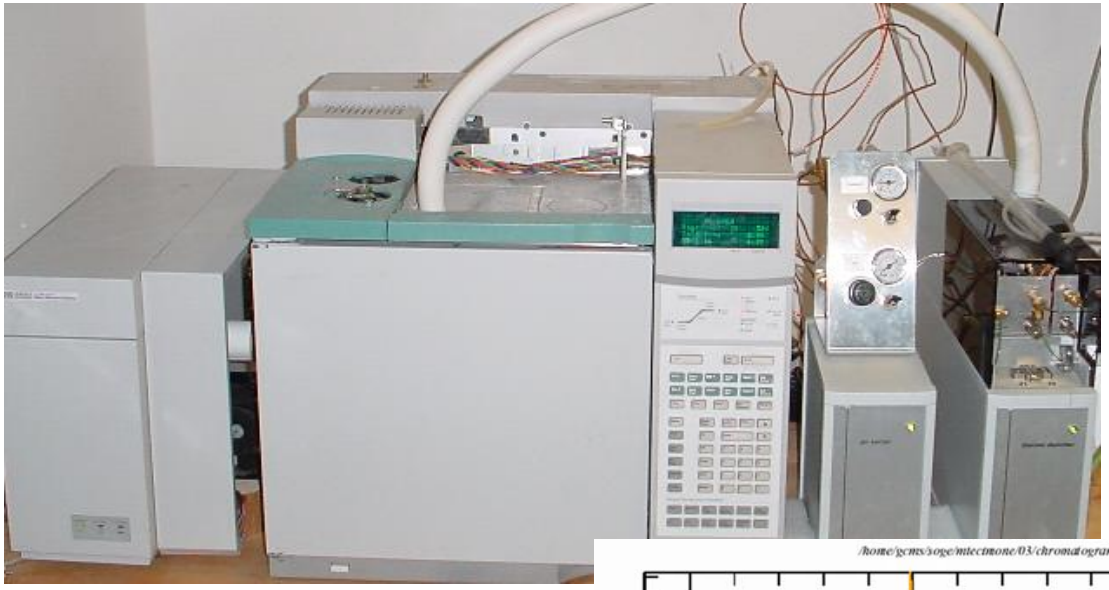
FID channel: CH_4 and CO

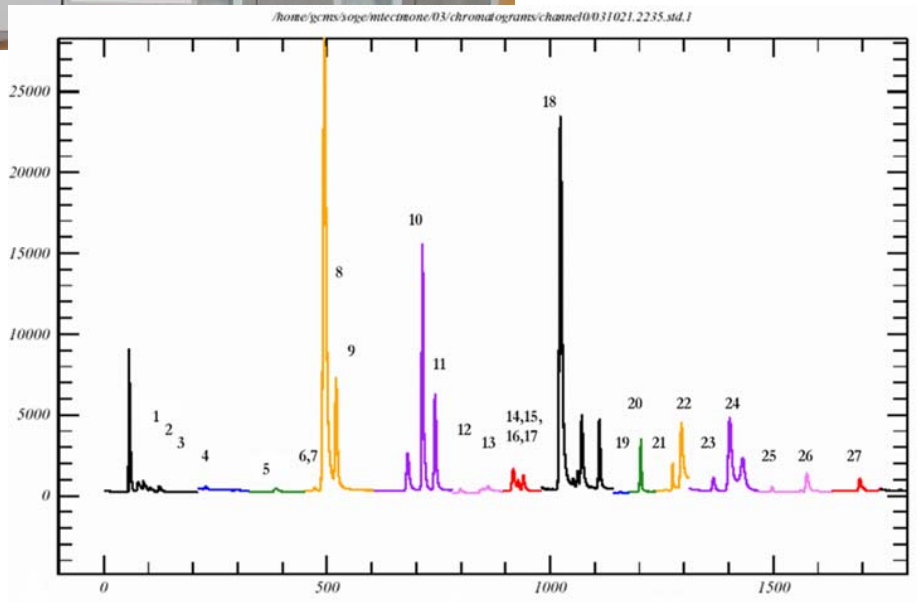




System for Observation of Halogenated Greenhouse Gases in Europe

HALOCARBONS MEASUREMENTS





1. C_2F_6
2. SF_6
3. HFC-23
4. Halon 1301
5. CFC-115
6. HFC-125
7. HFC-143a
8. CFC-12
9. HCFC-22
10. CH_3Cl
11. HFC-134a
12. Halon 1211
13. HFC-152b
14. CFC-114
15. CH_3Br
16. HCFC-142b
17. HCFC-124b
18. CFC-11
19. CH_3I
20. CH_2Cl_2
21. HCFC-141b
22. CFC-113
23. $CHCl_3$
24. CCl_4
25. $CHCCl_3$
26. CH_3CCl_3
27. C_2Cl_4

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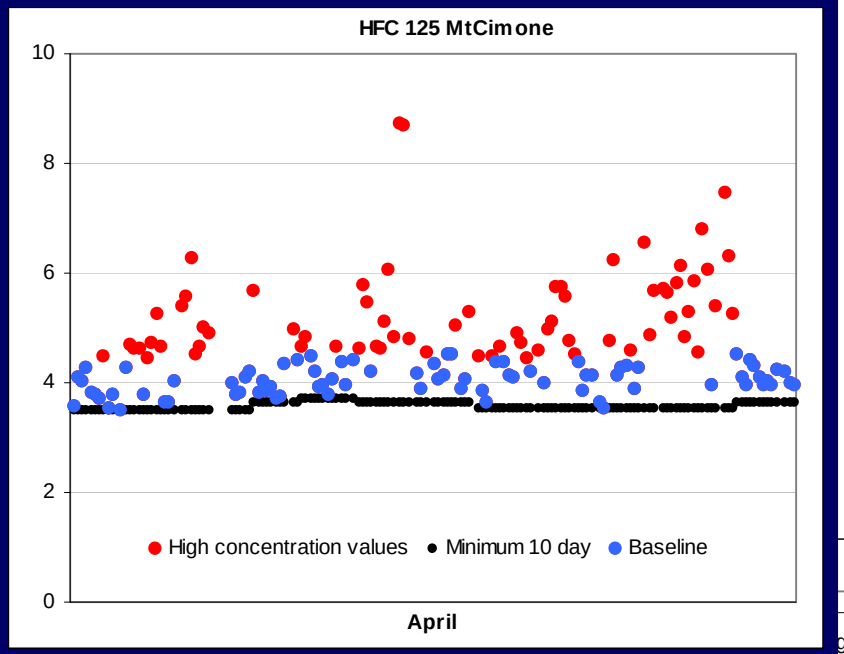
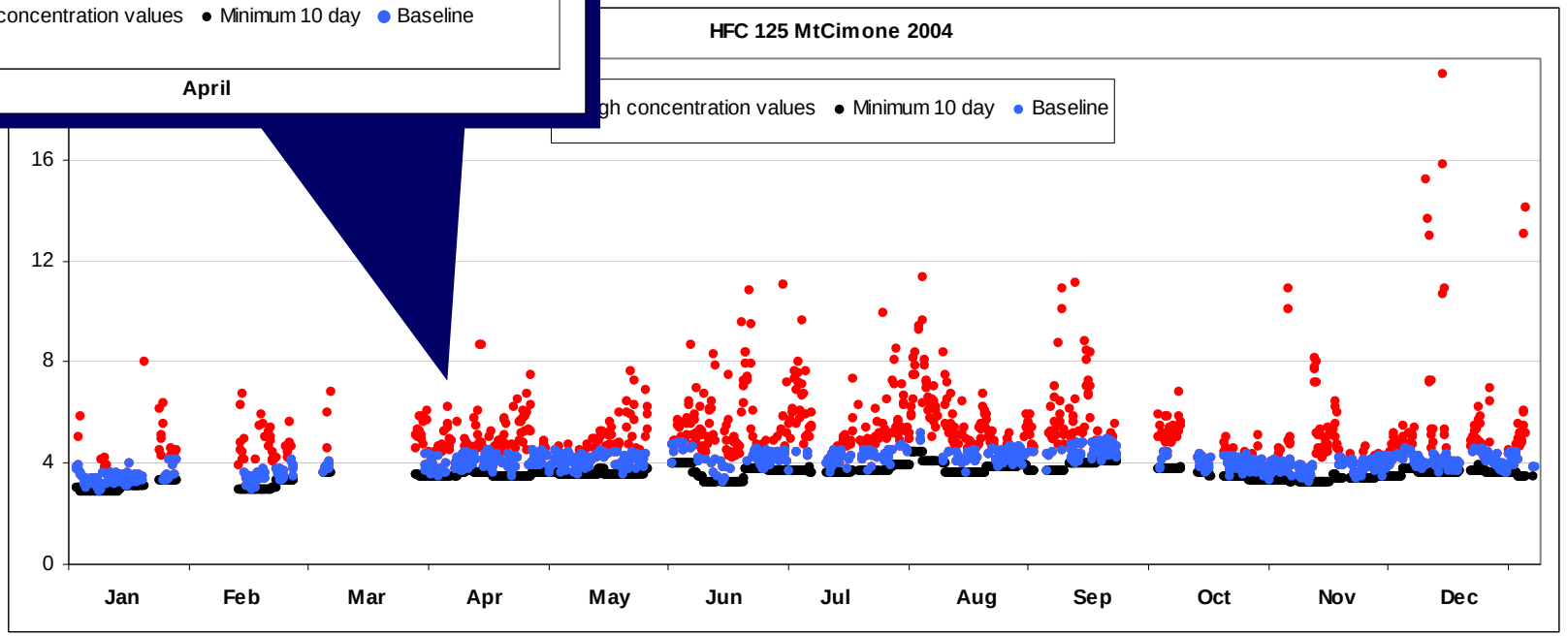
Baseline values and concentration peaks





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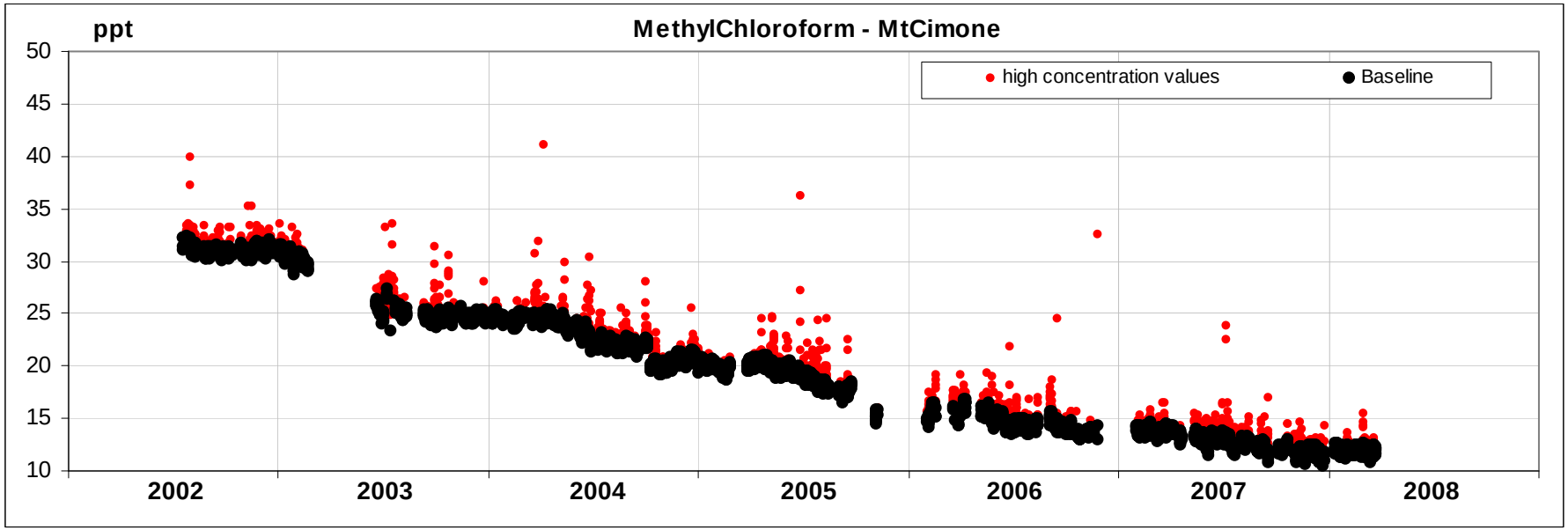
Trends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MethylChloroform - MtCimone
high concentration values
Baseline
50
45
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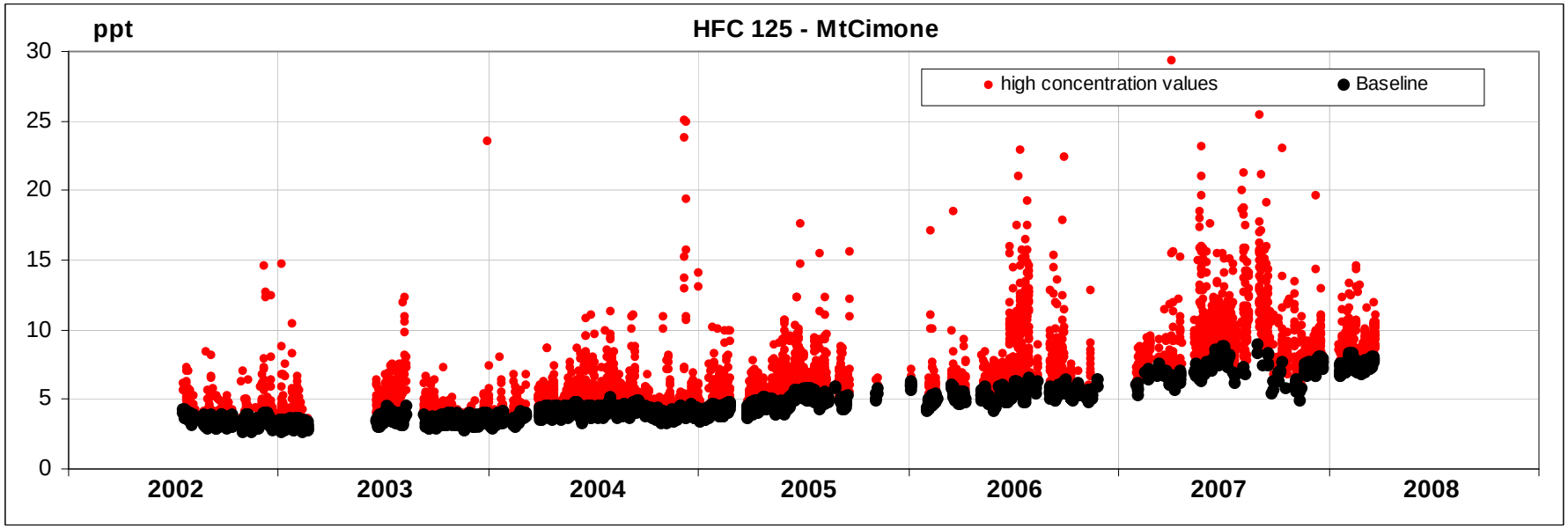
2002
2003
2004
2005
2006
2007
2008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HFC 125 - MtCimone
high concentration values
Baseline
30
25
20
15
10
5
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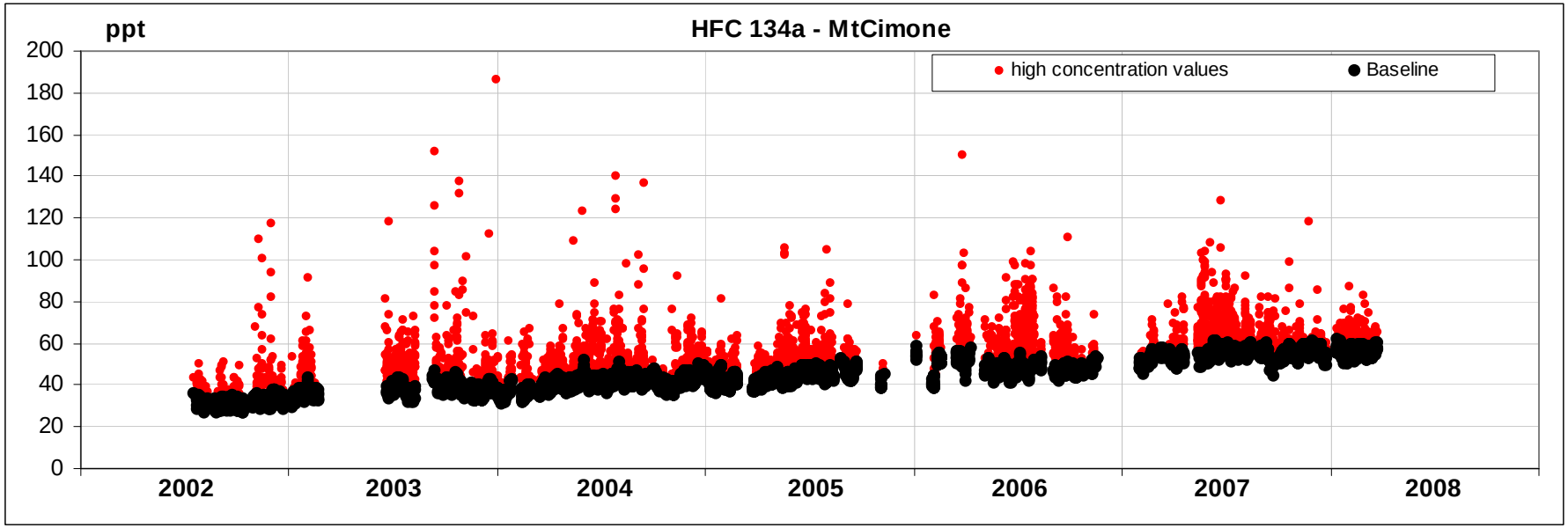
2002
2003
2004
2005
2006
2007
2008

Trends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HFC 134a - MtCimone
high concentration values
Baseline
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160
140
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100
80
60
40
20
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2002
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2005
2006
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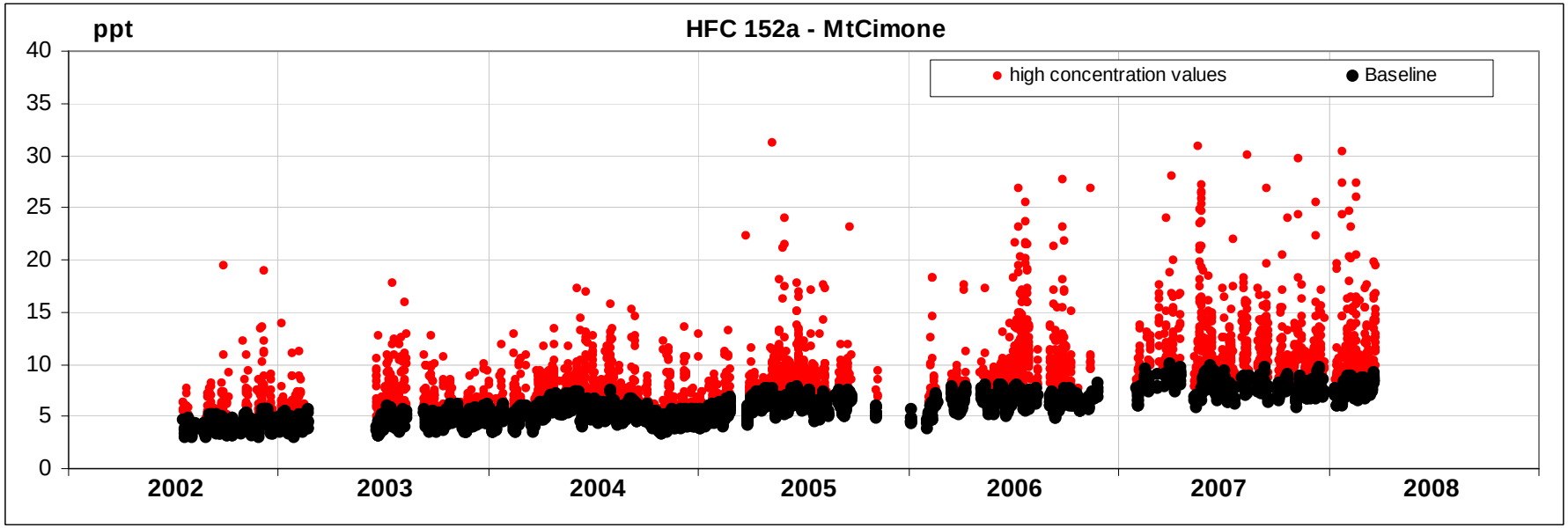
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HFC 152a - MtCimone
high concentration values
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Back attribution techniques for source allocation

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Forward modelling

Following A.Manning et al (JGR, 2003) a forward approach has been implemented

A constant release was emitted from 780 cells (100 km x 100 km) covering whole Europe >>

Data measured at Mt Cimone and modelled contributions of each cell to Mt Cimone station were used for deriving back-attribution of source strengths through a *stepwise regression procedure* >>

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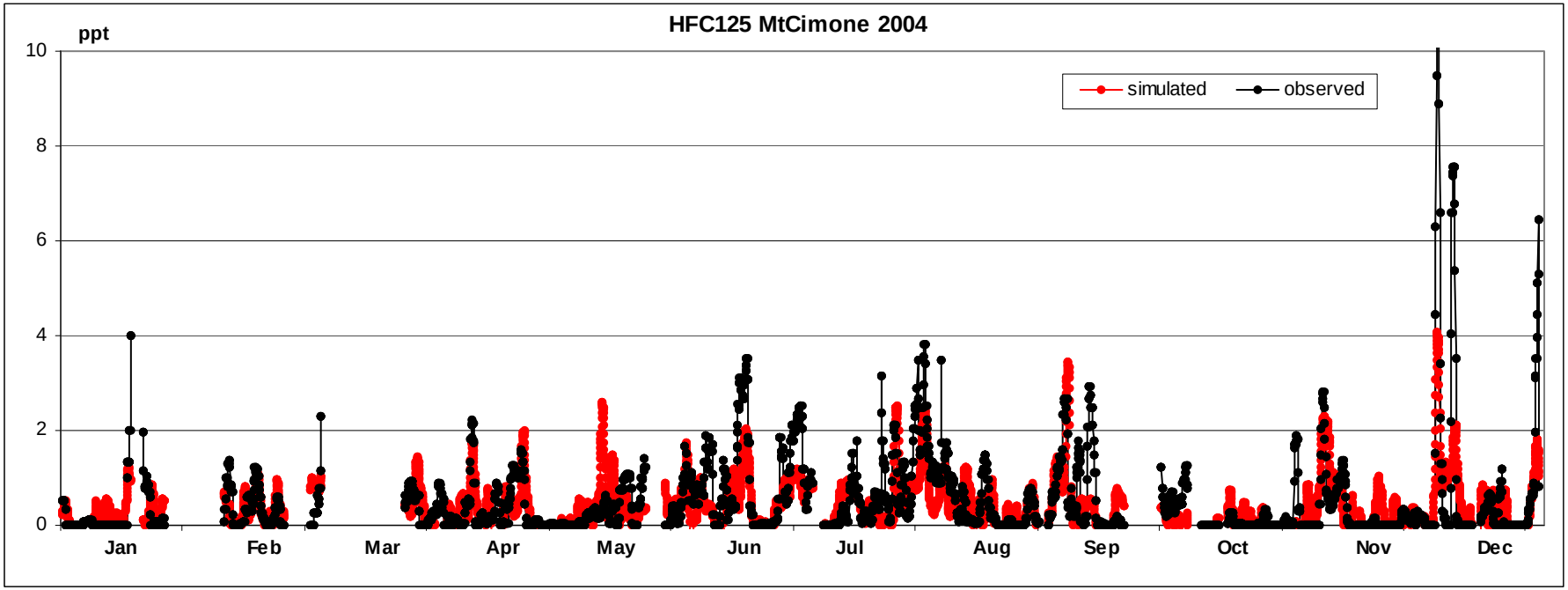
HFC-125 : Monte Cimone



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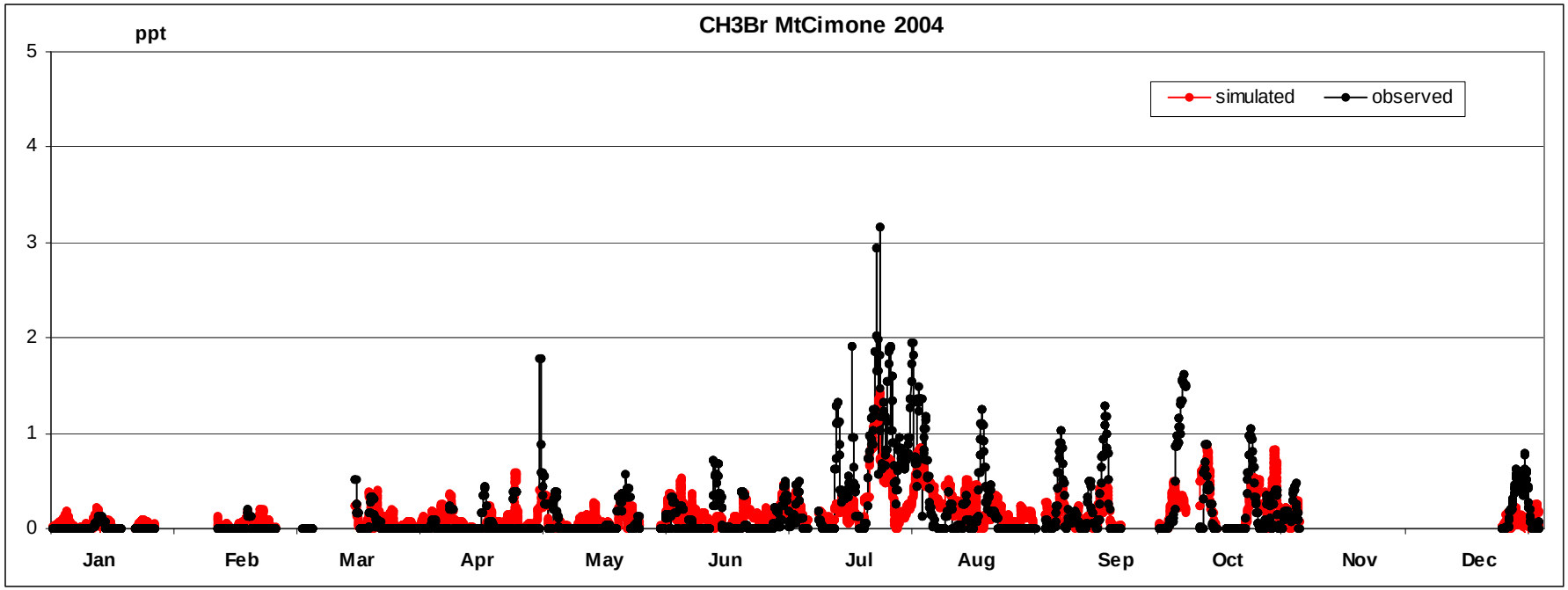
MeBr : Monte Cimone



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Some statistical indeces

receptor	correlation	Factor 2
MH HFC125	0.91	0.96
MH MeBr	0.75	0.83
MtC HFC125	0.61	0.73
MtC MeBr	0.40	0.77

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Conclusions

The proposed procedure has been shown to be able to reproduce “simple” cases. However, so far it is not fully reliable in very complex situations, as that of Monte Cimone, characterised by a complex meteorological and source field.

However, improvements in the description of atmospheric circulation as well as availability of longer time series, could make this technique more reliable in localisation and quantification of source regions

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Acknowledgements

The SOGE consortium: S. Reimann, M. Vollmer (EMPA, CH) P. Simmonds, B.Greally, S. O'Doherty (University of Bristol, UK) F. Stordal (University of Oslo, NO)

Ray Weiss and the SIO98 scale, the University of Bristol and the UB 98 scale

Paolo Bonasoni, station chief, and all the staff of the CNR "O. Vittori" research station at Mt. Cimone

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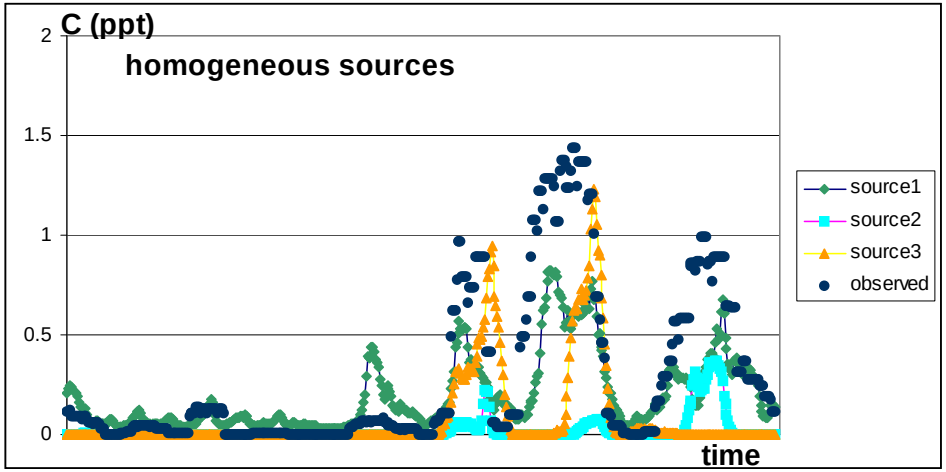

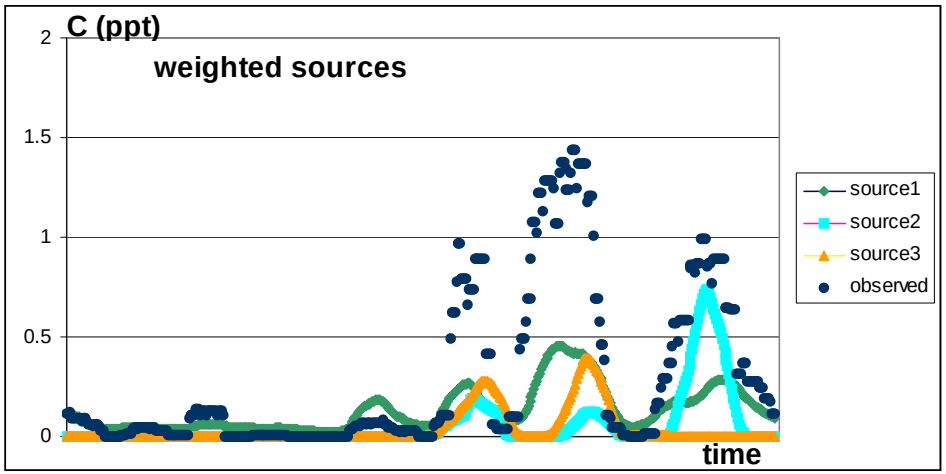

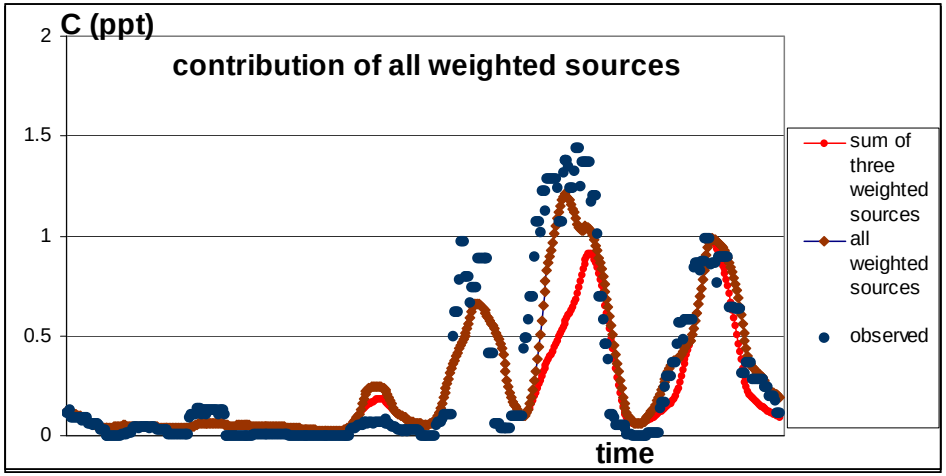

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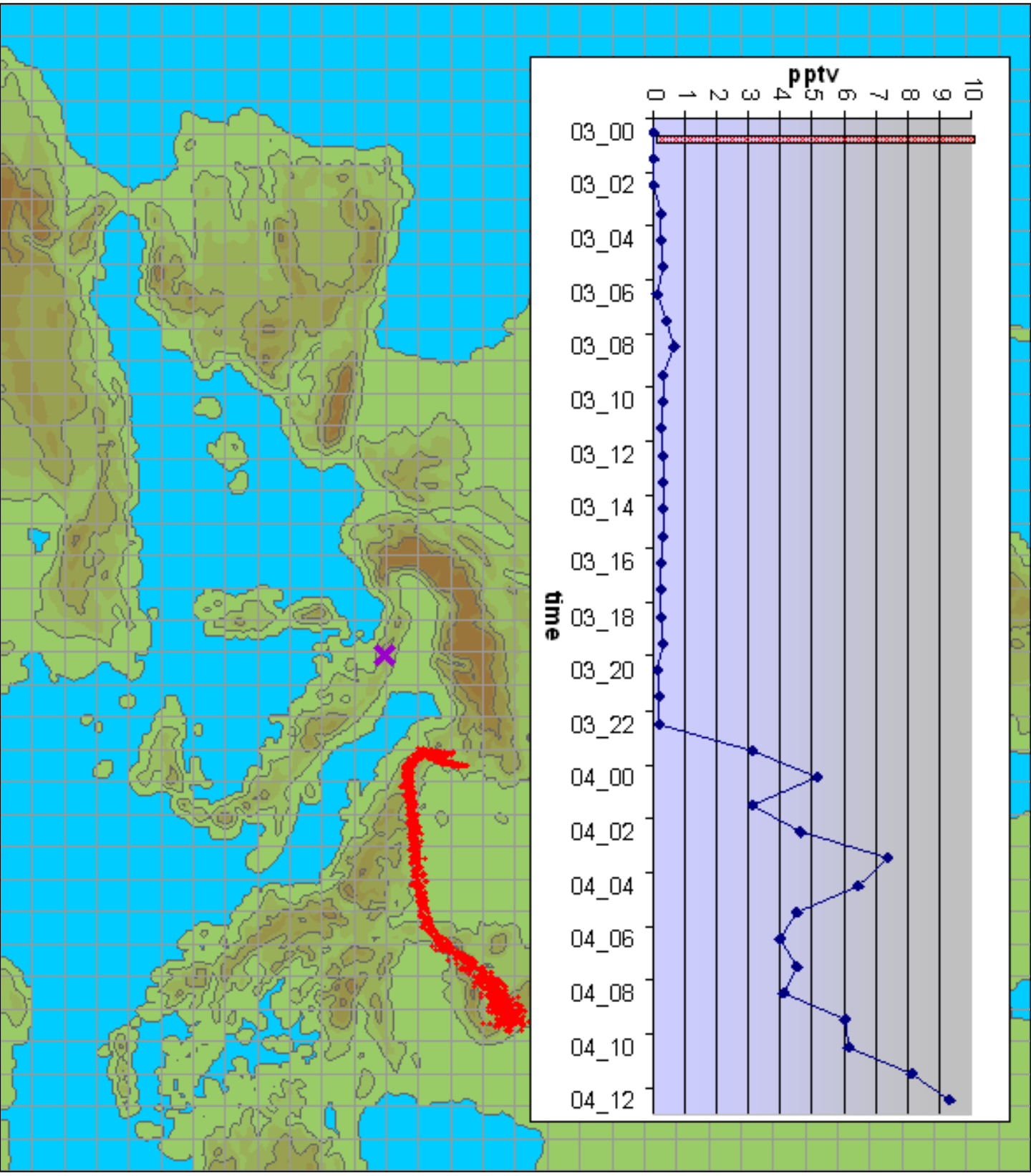
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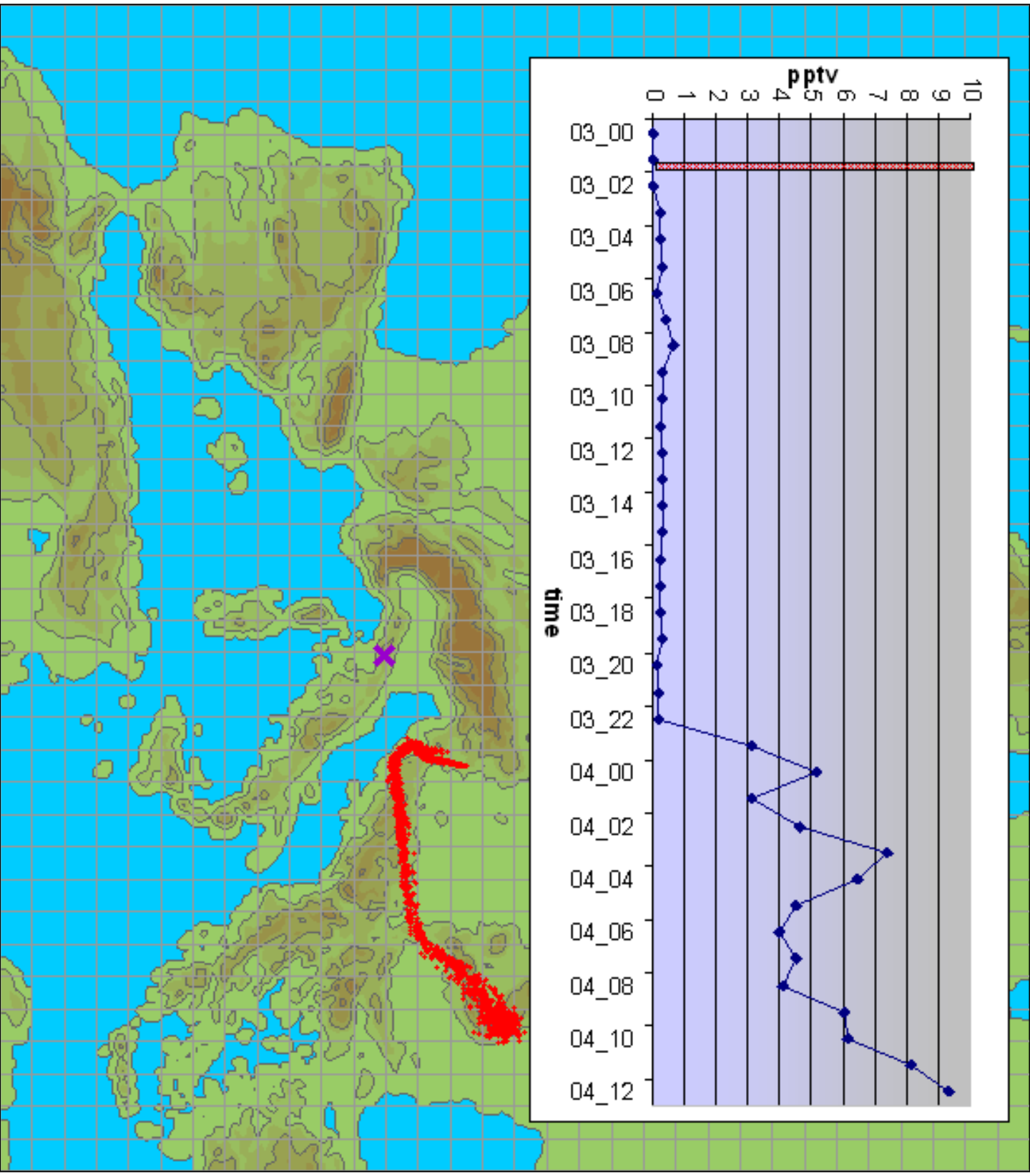
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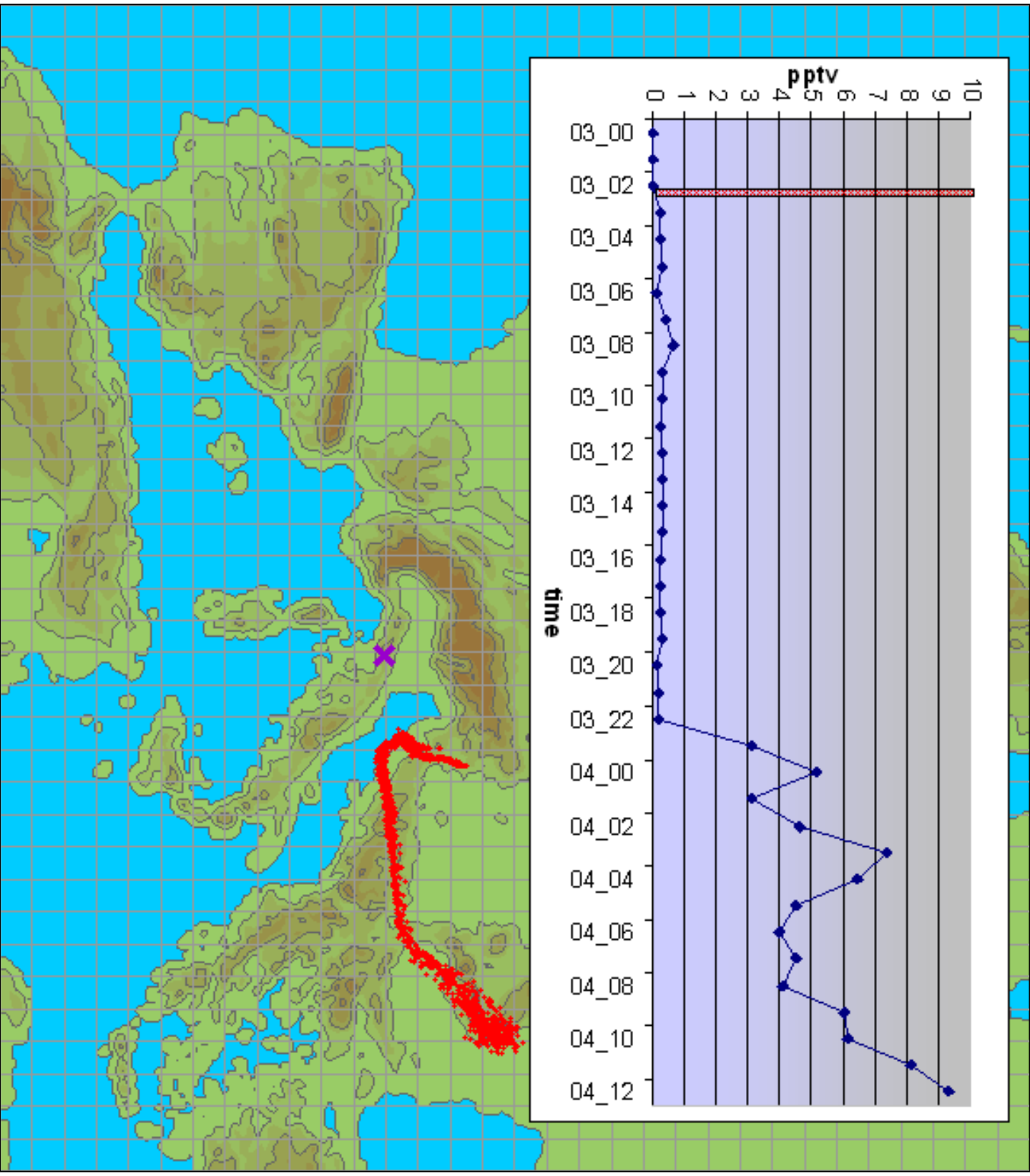
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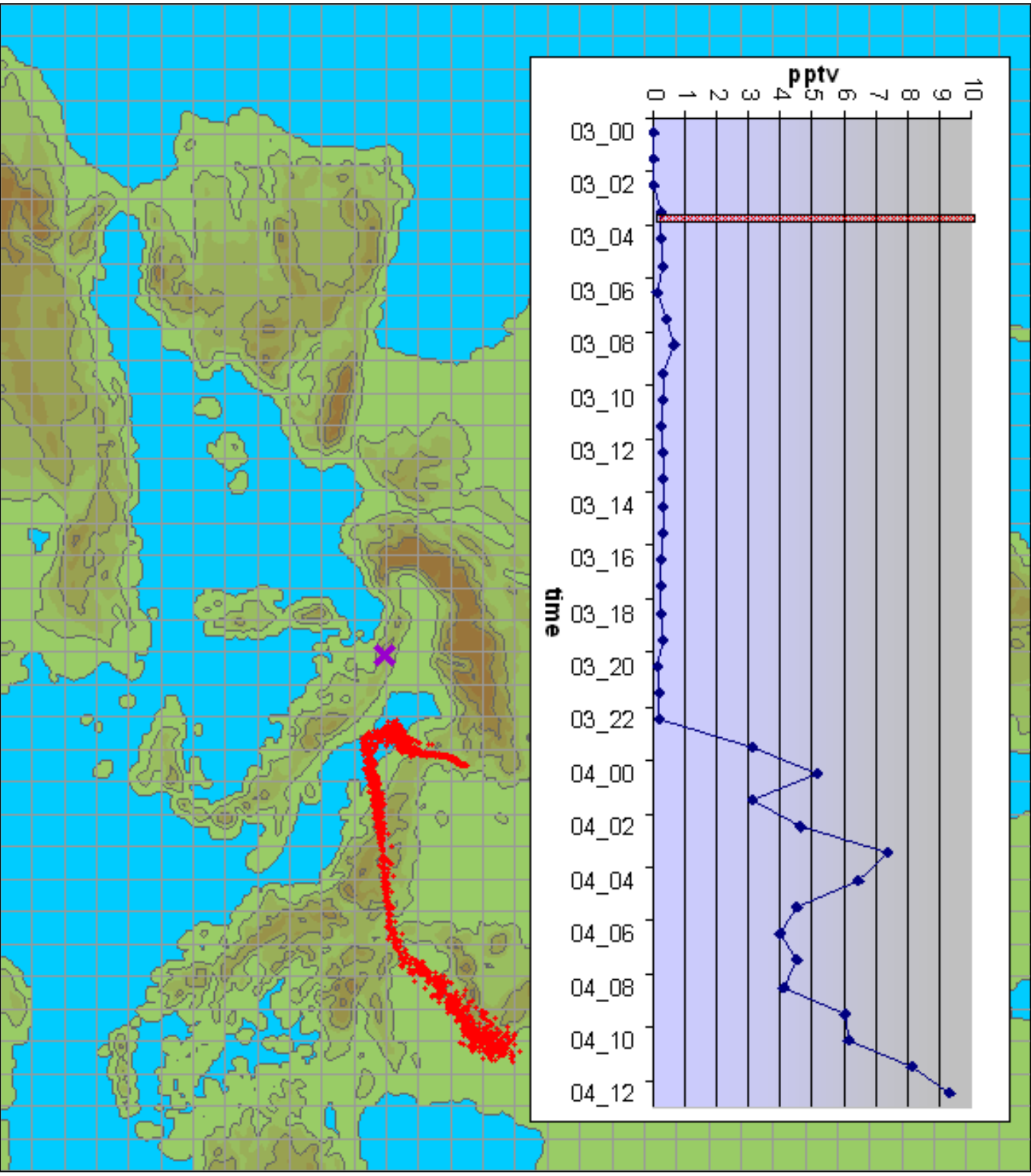
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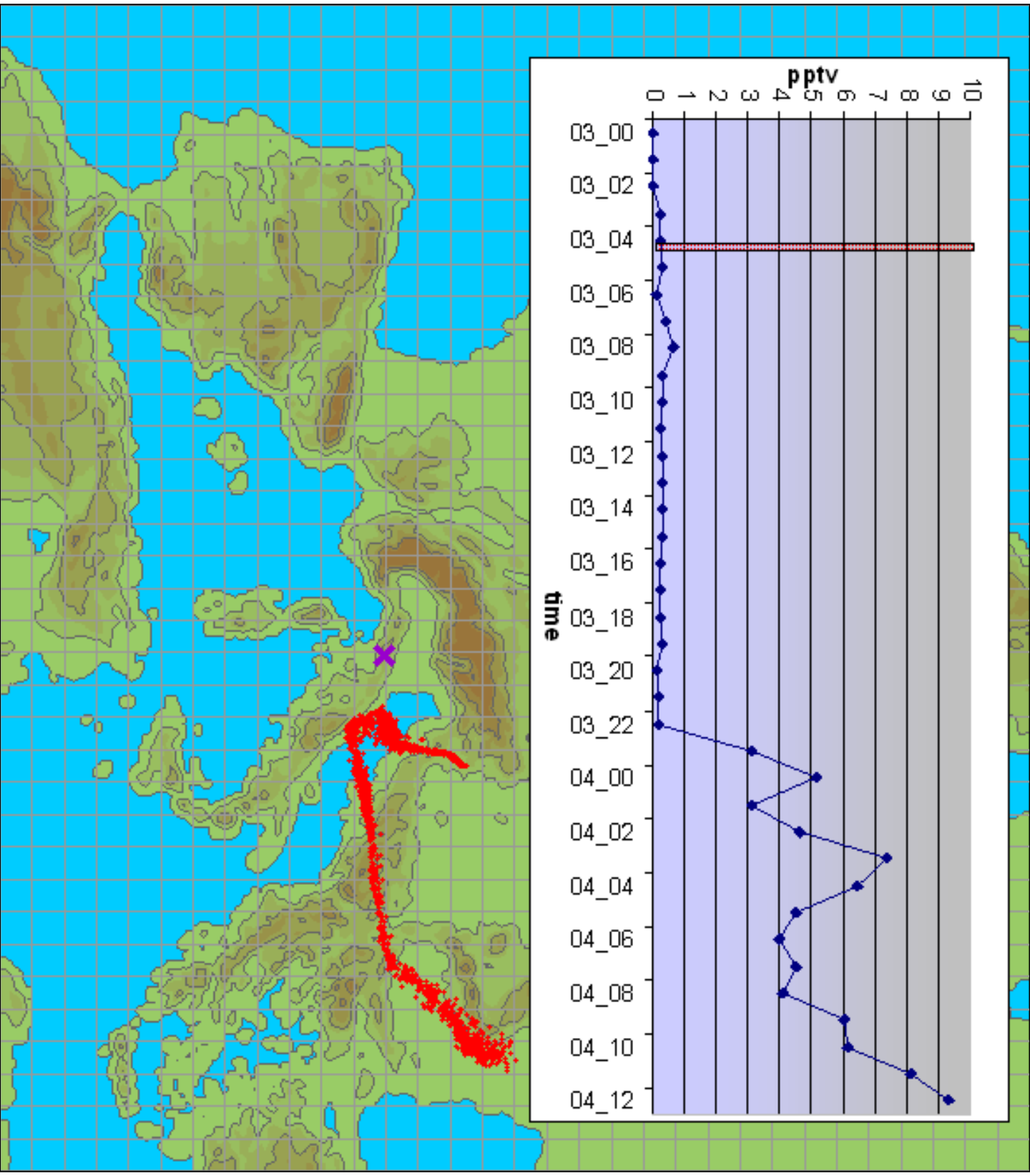
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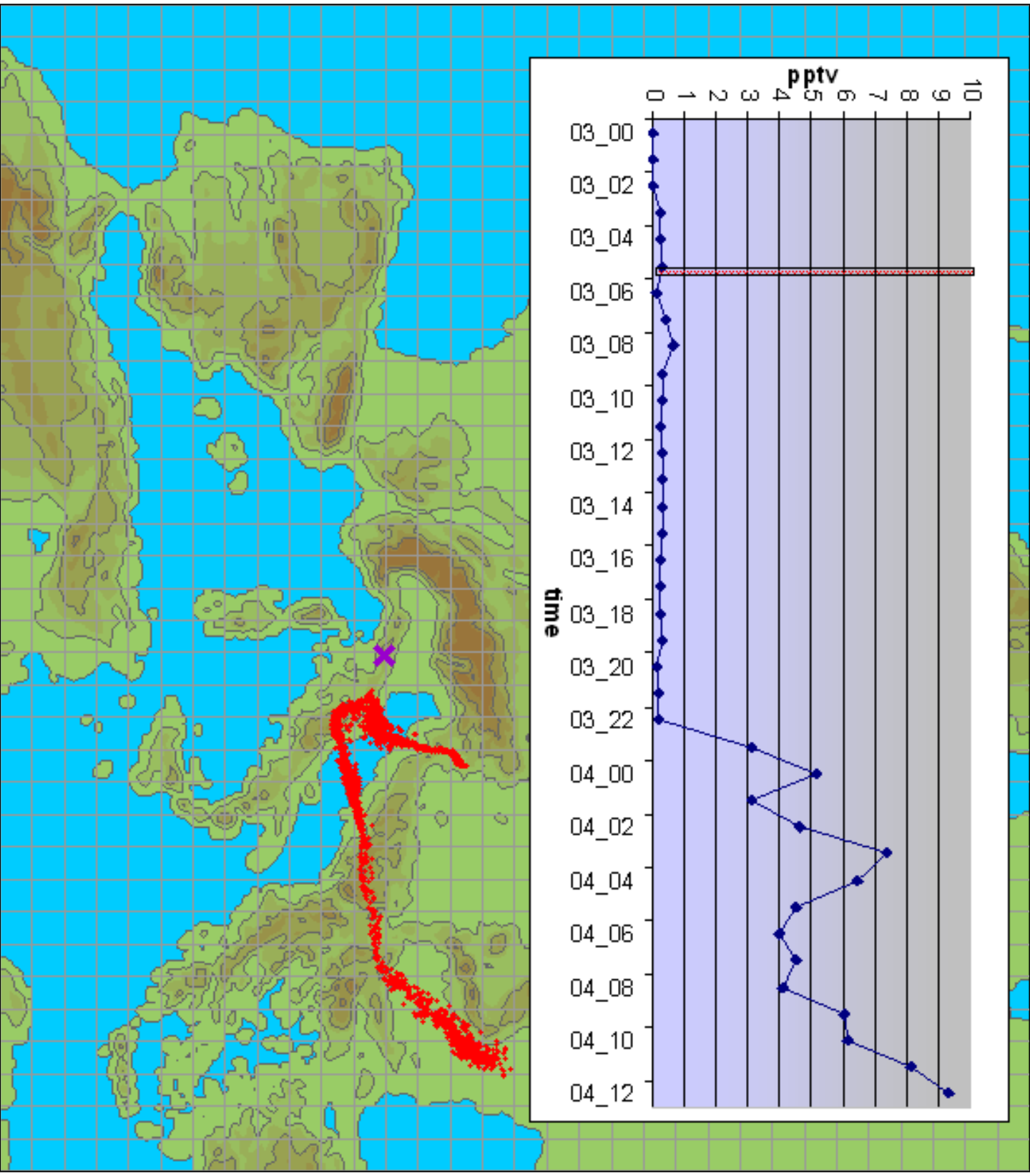
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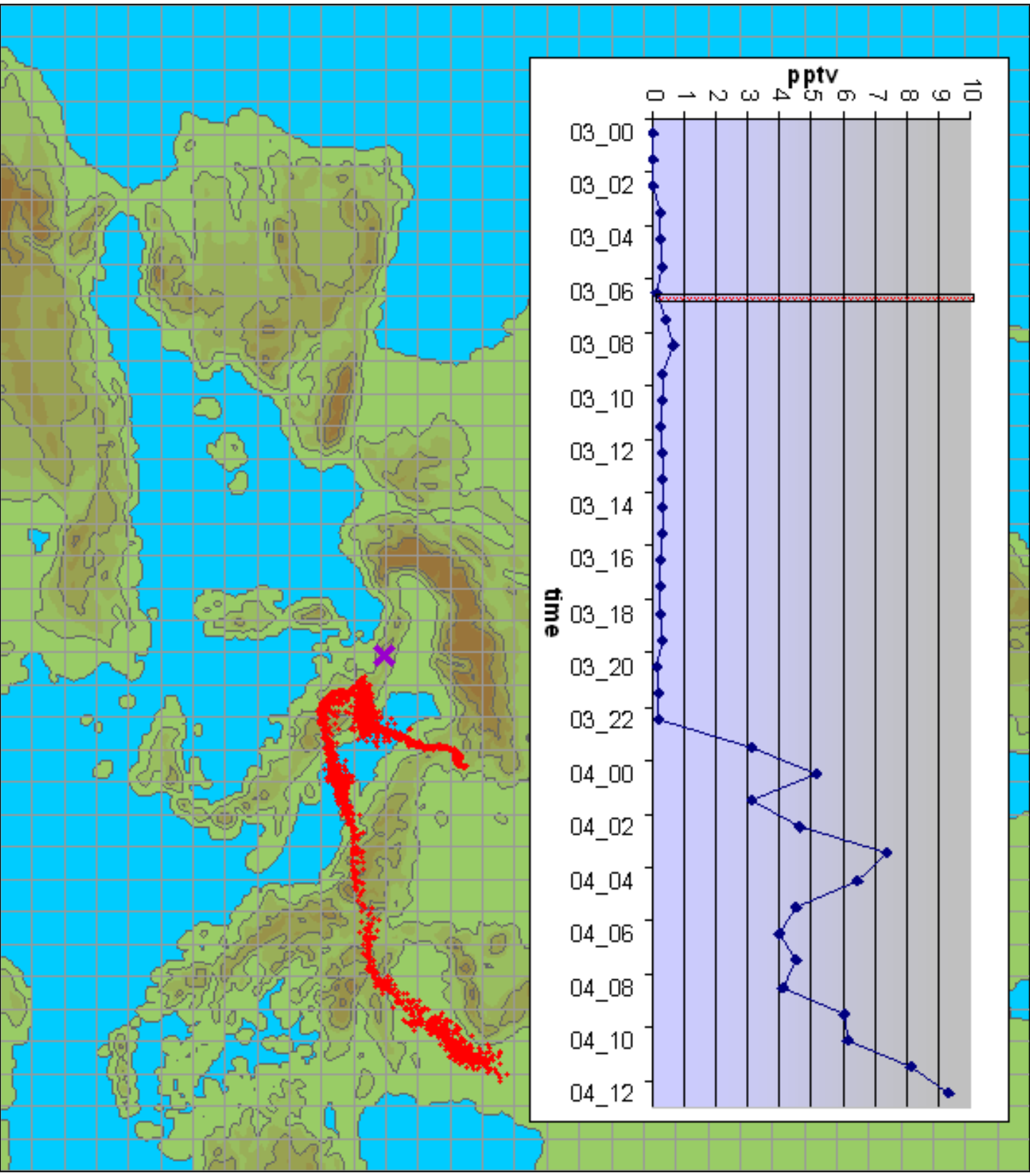
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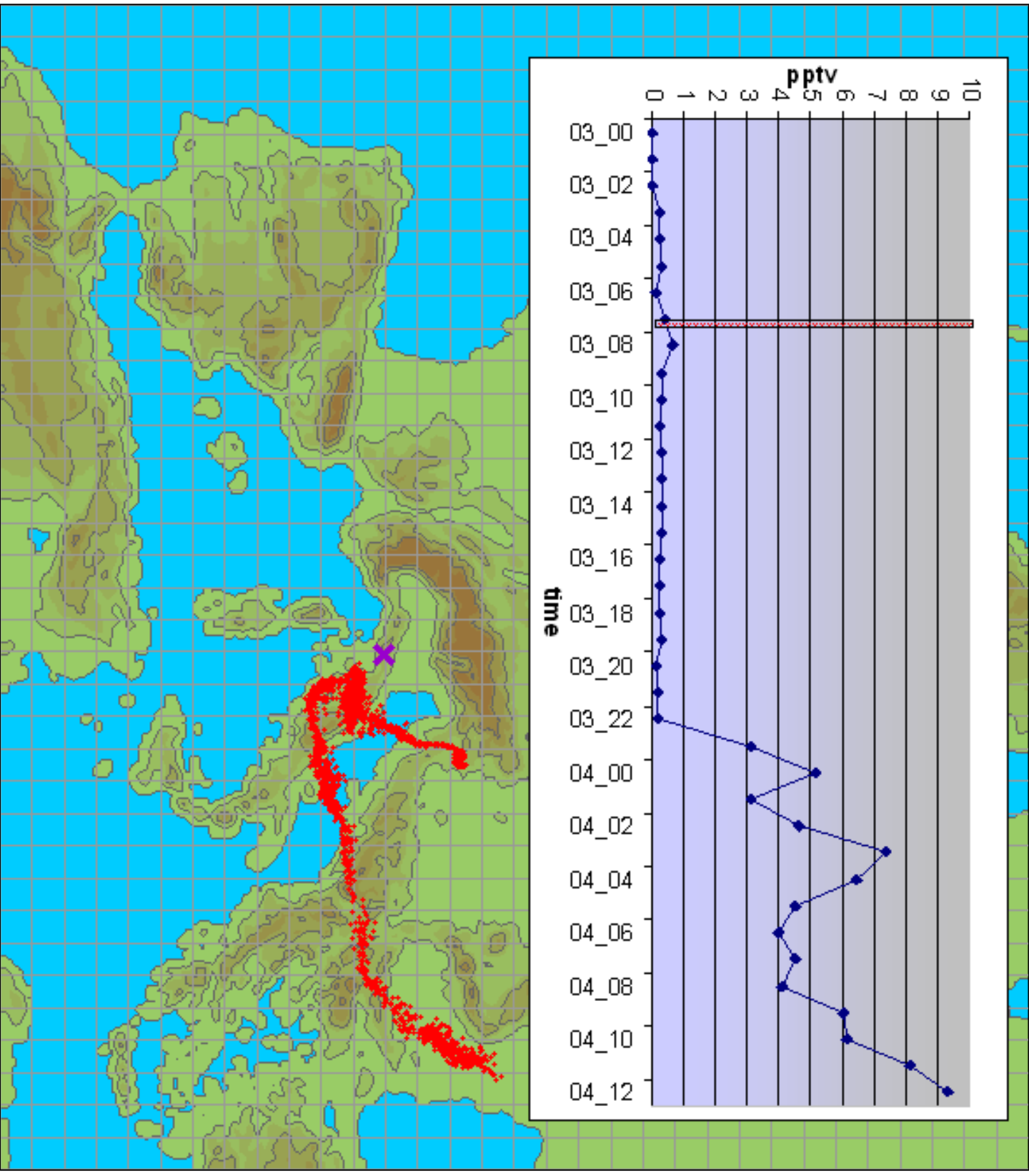
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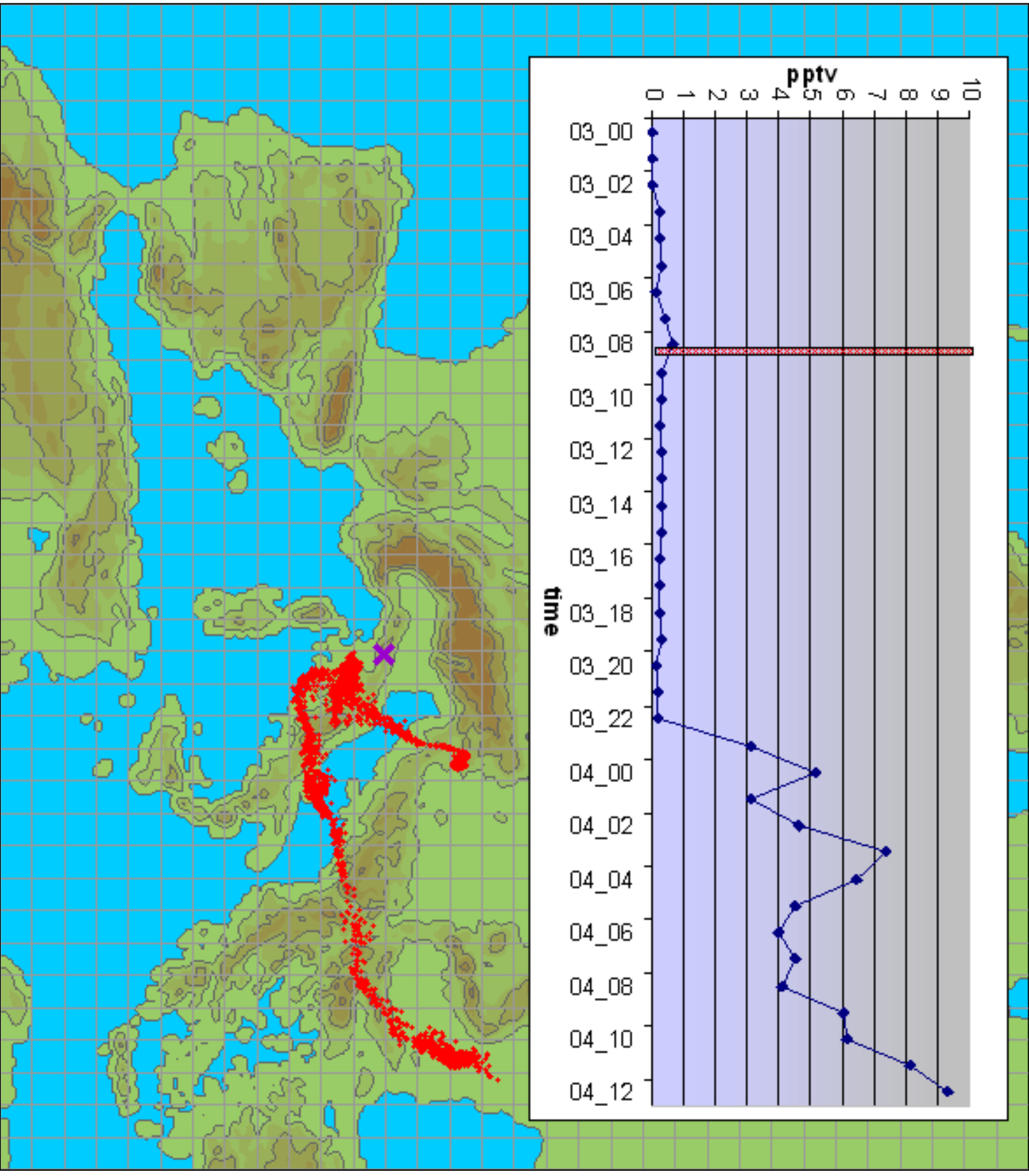
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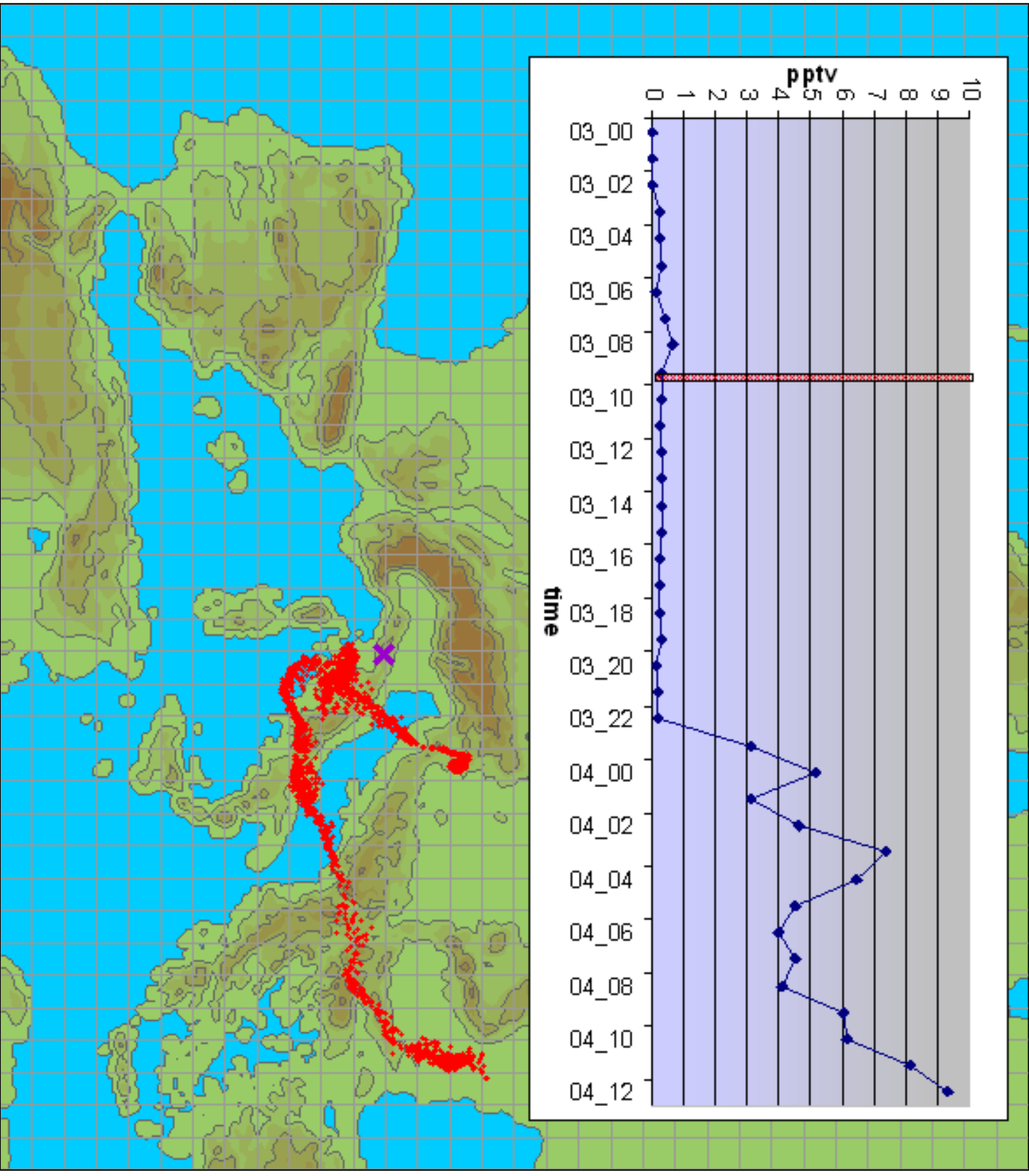
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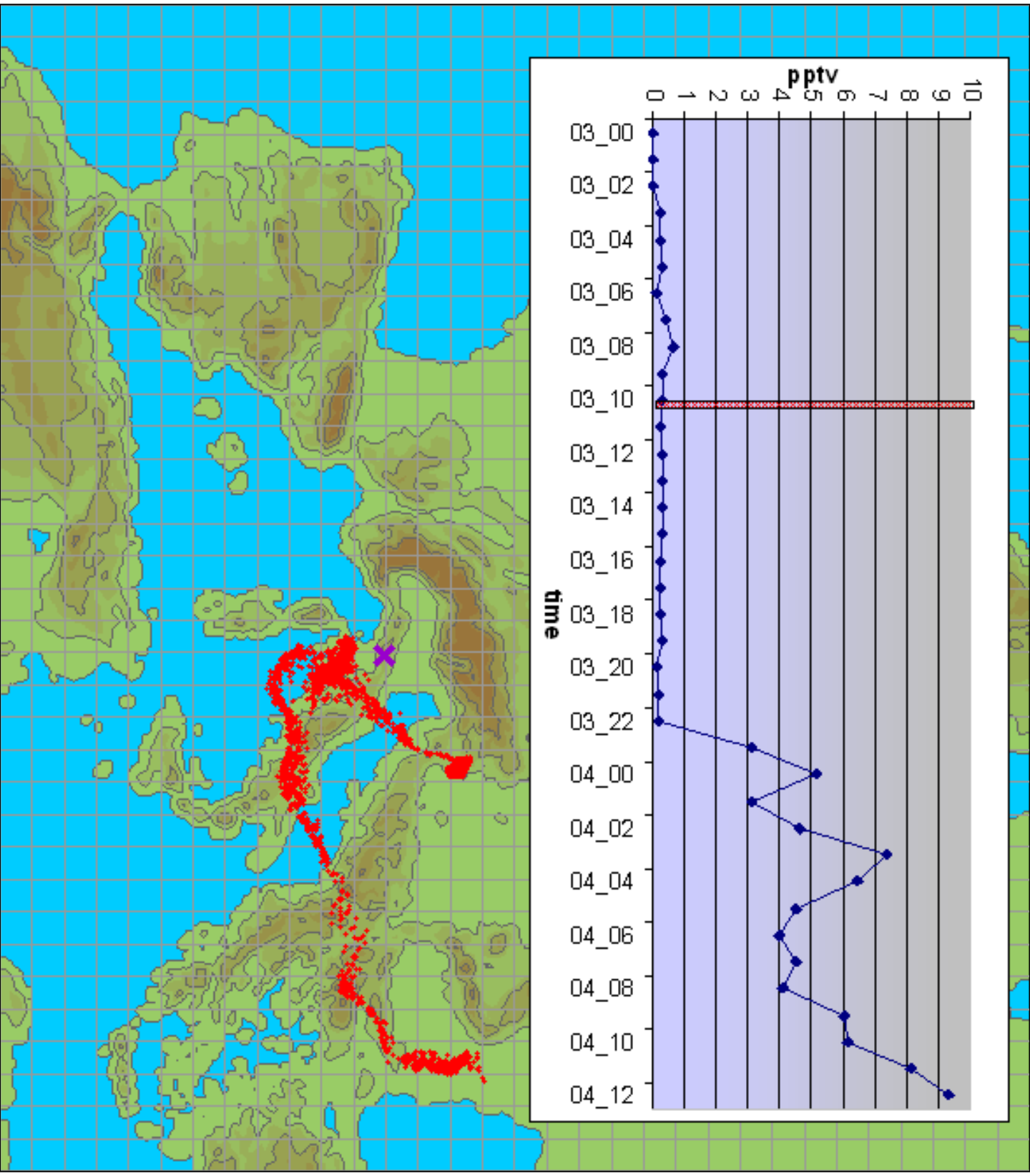
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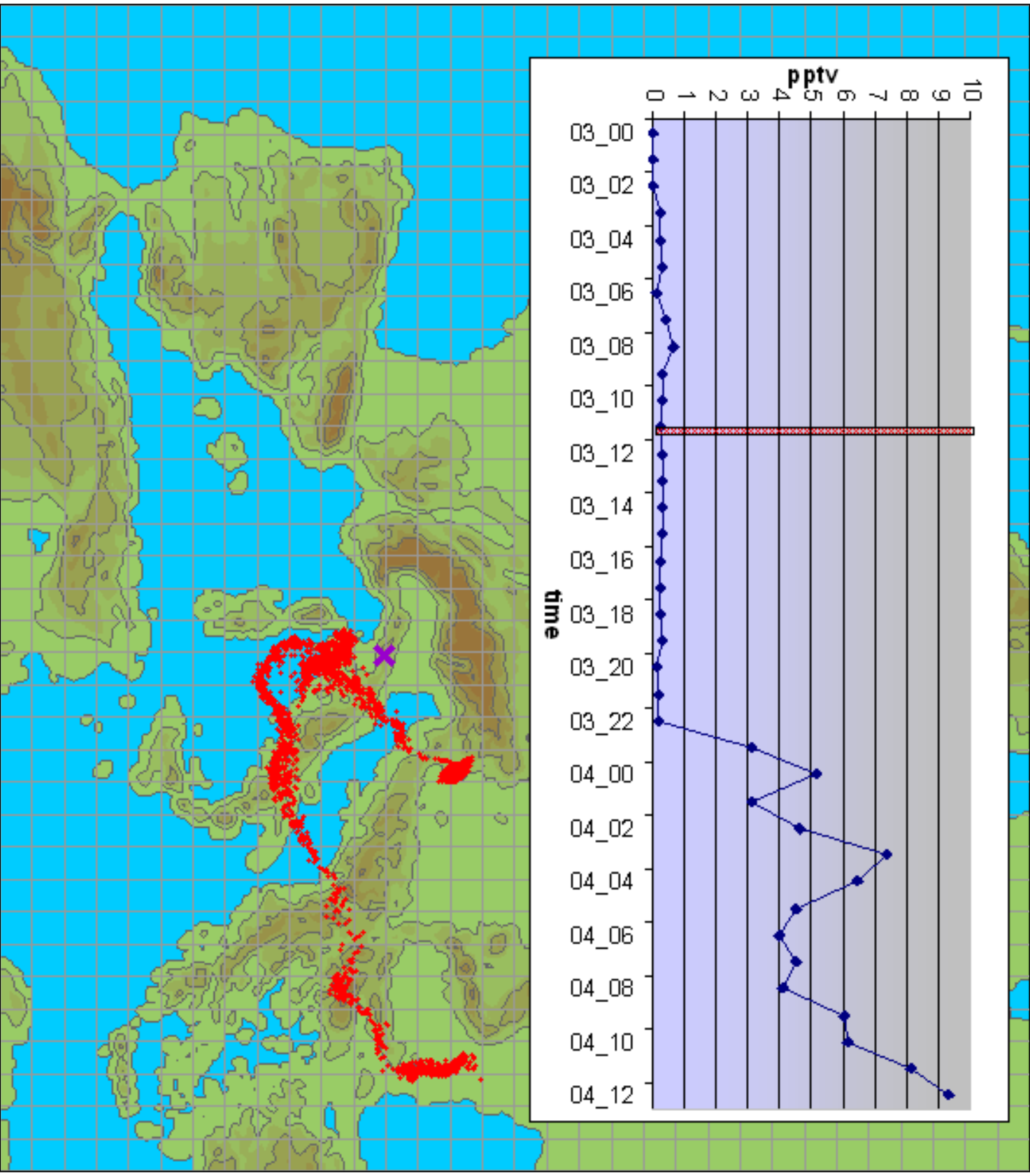
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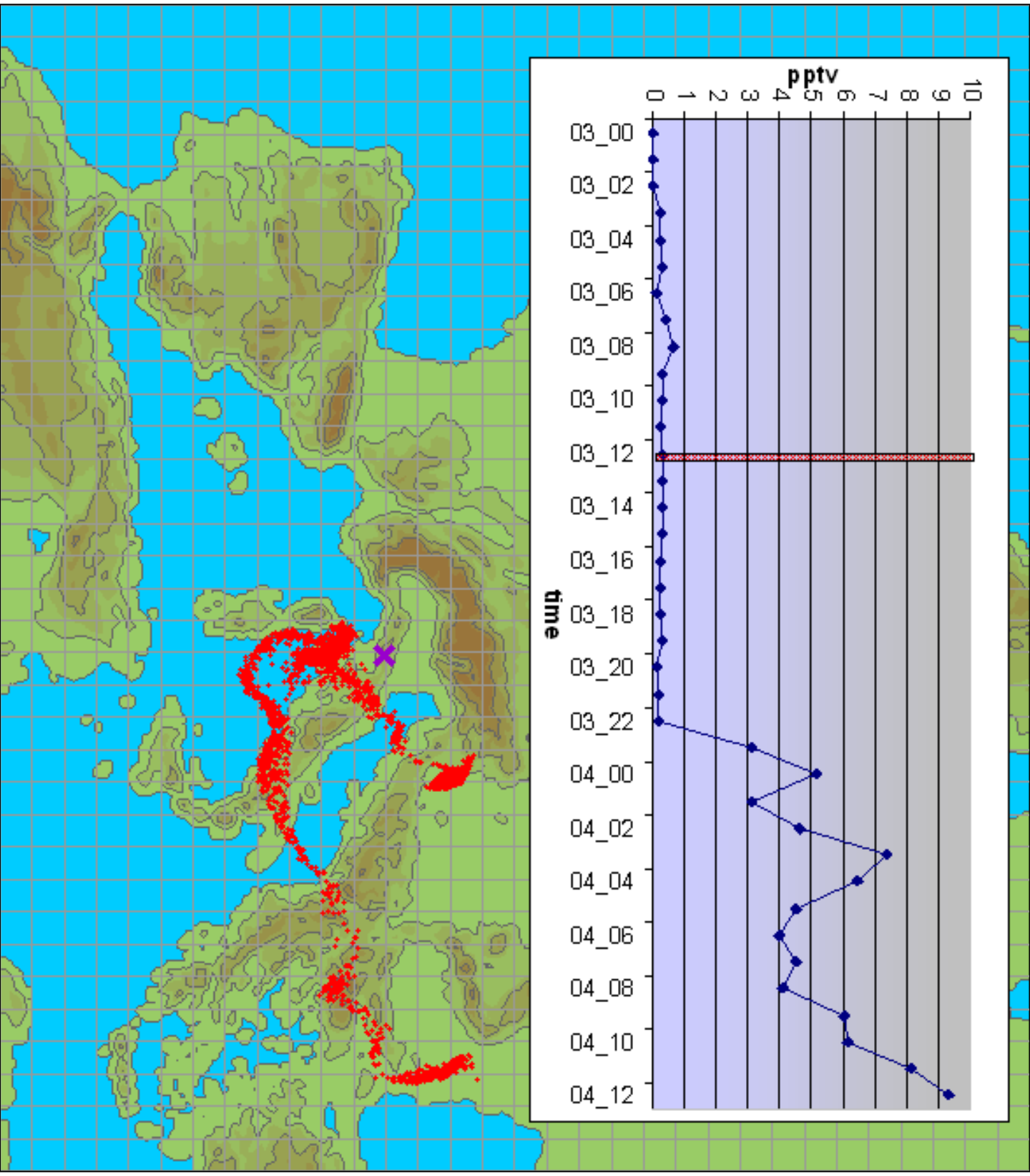
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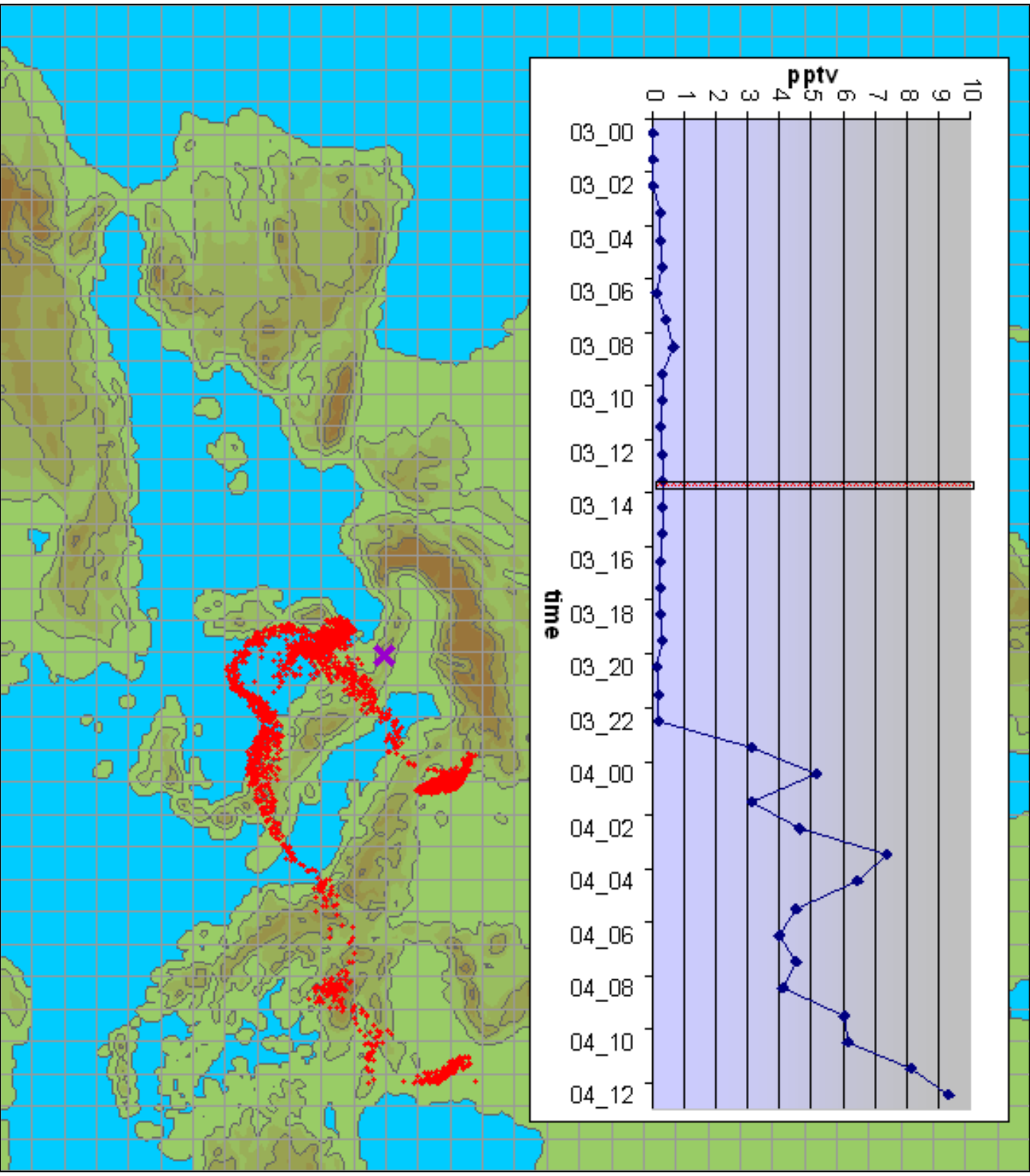
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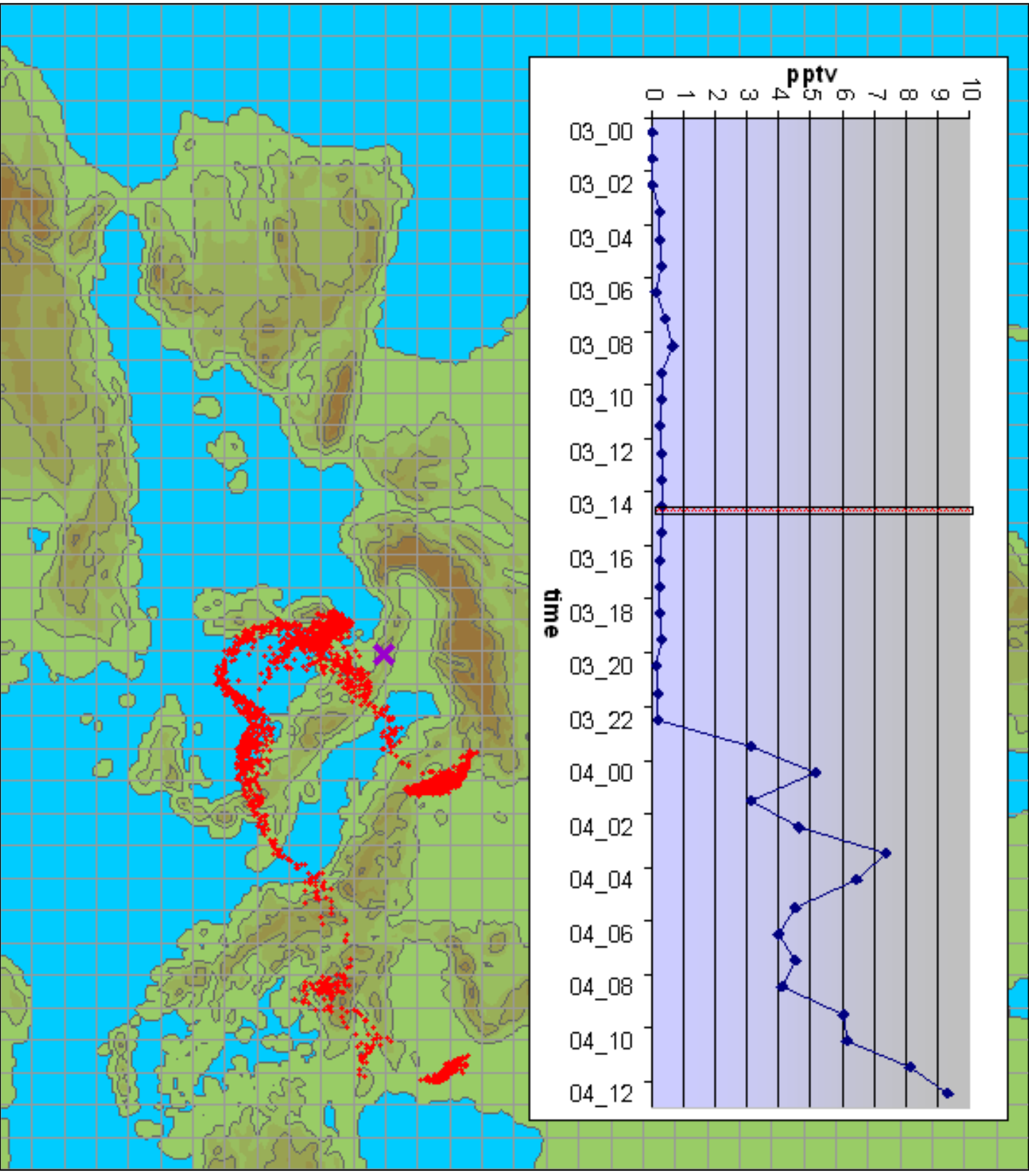
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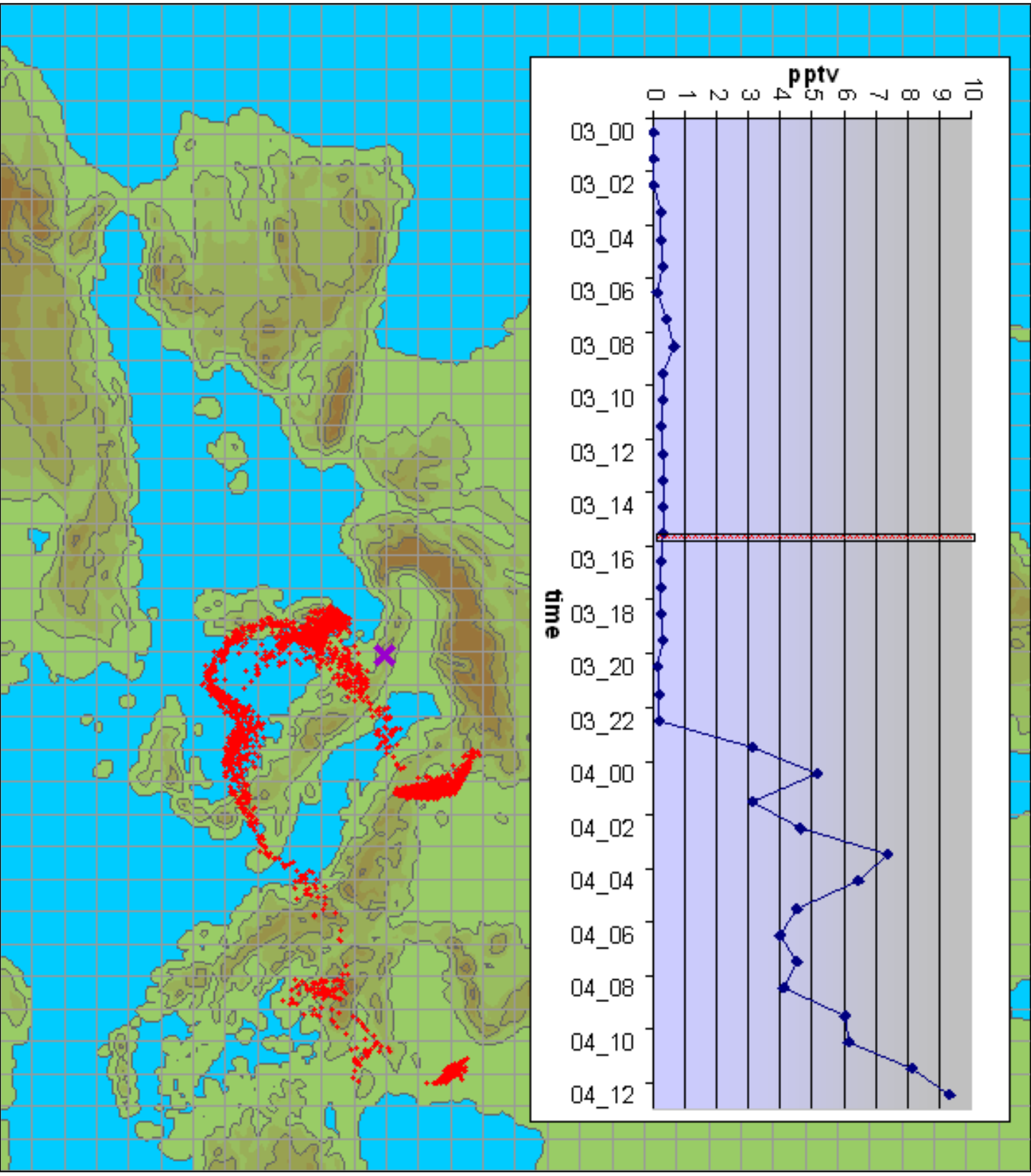
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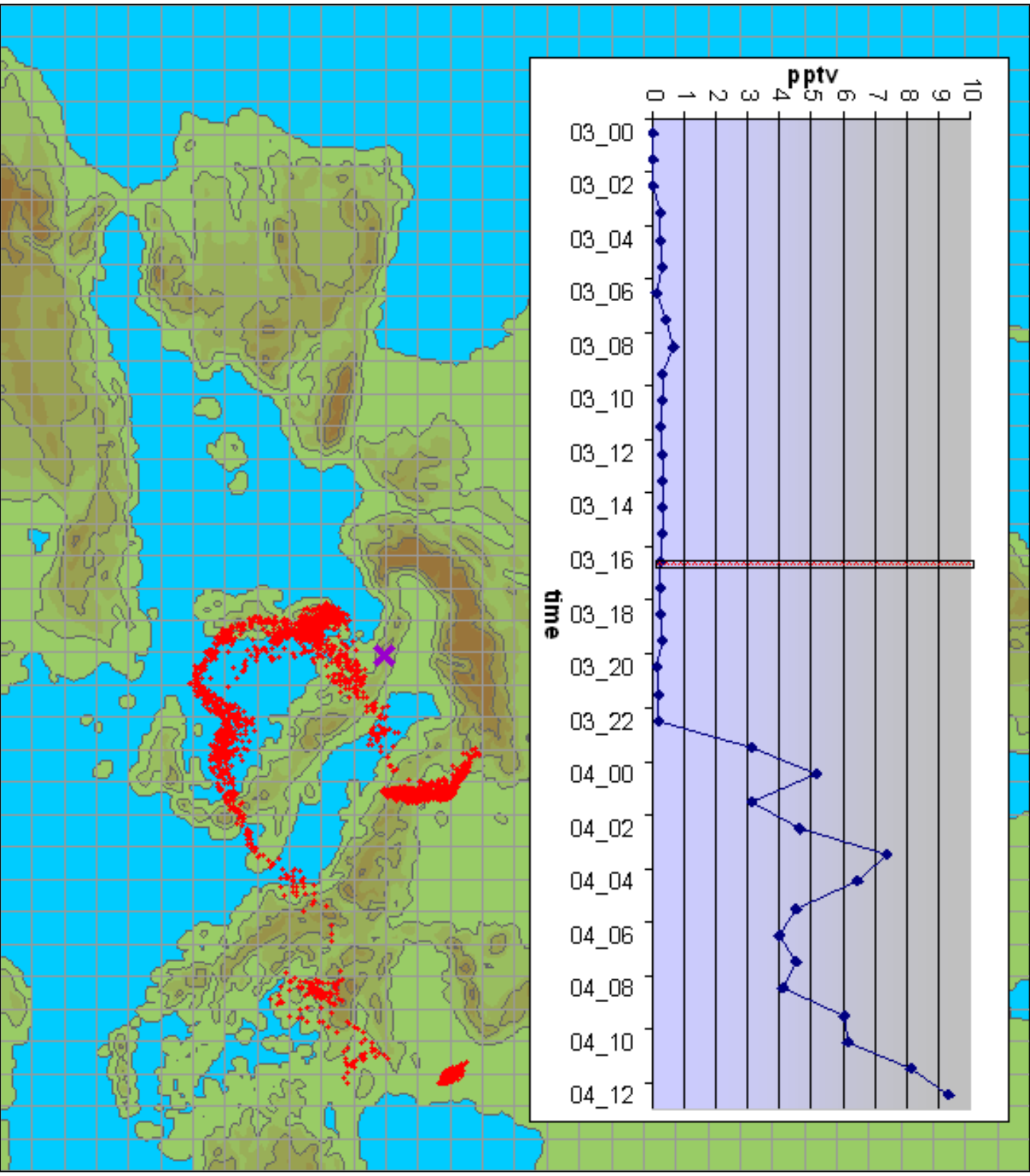
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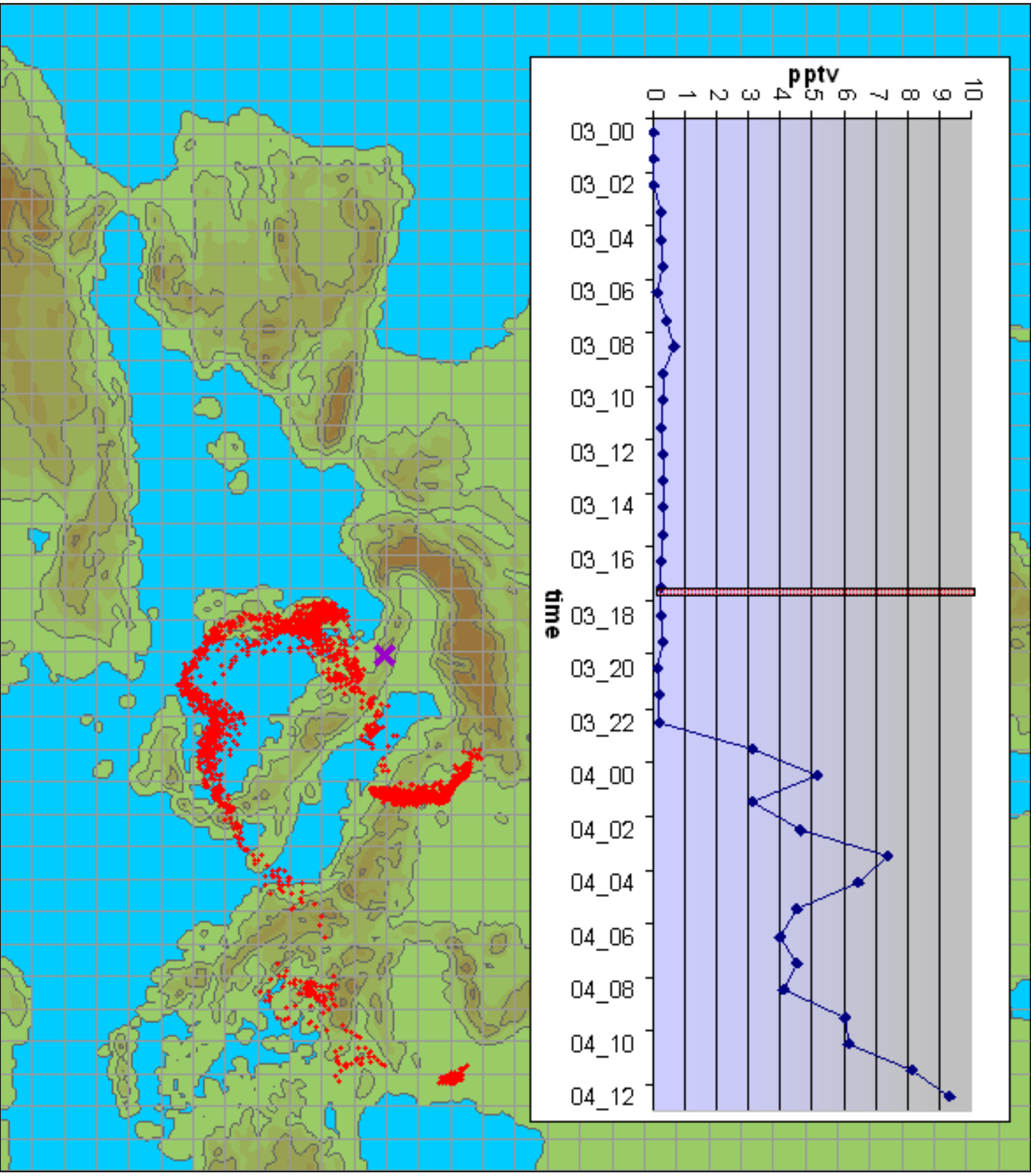
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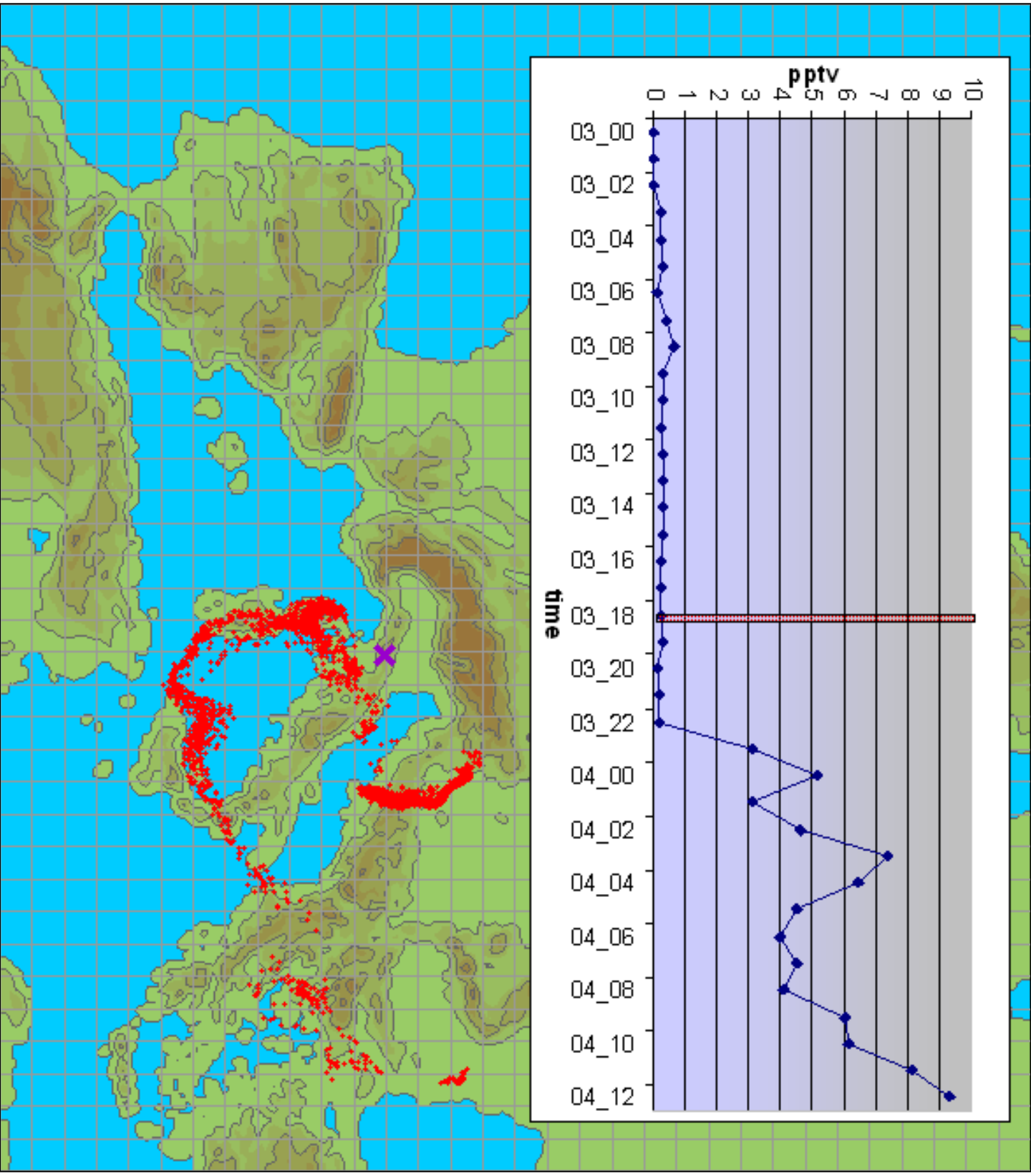
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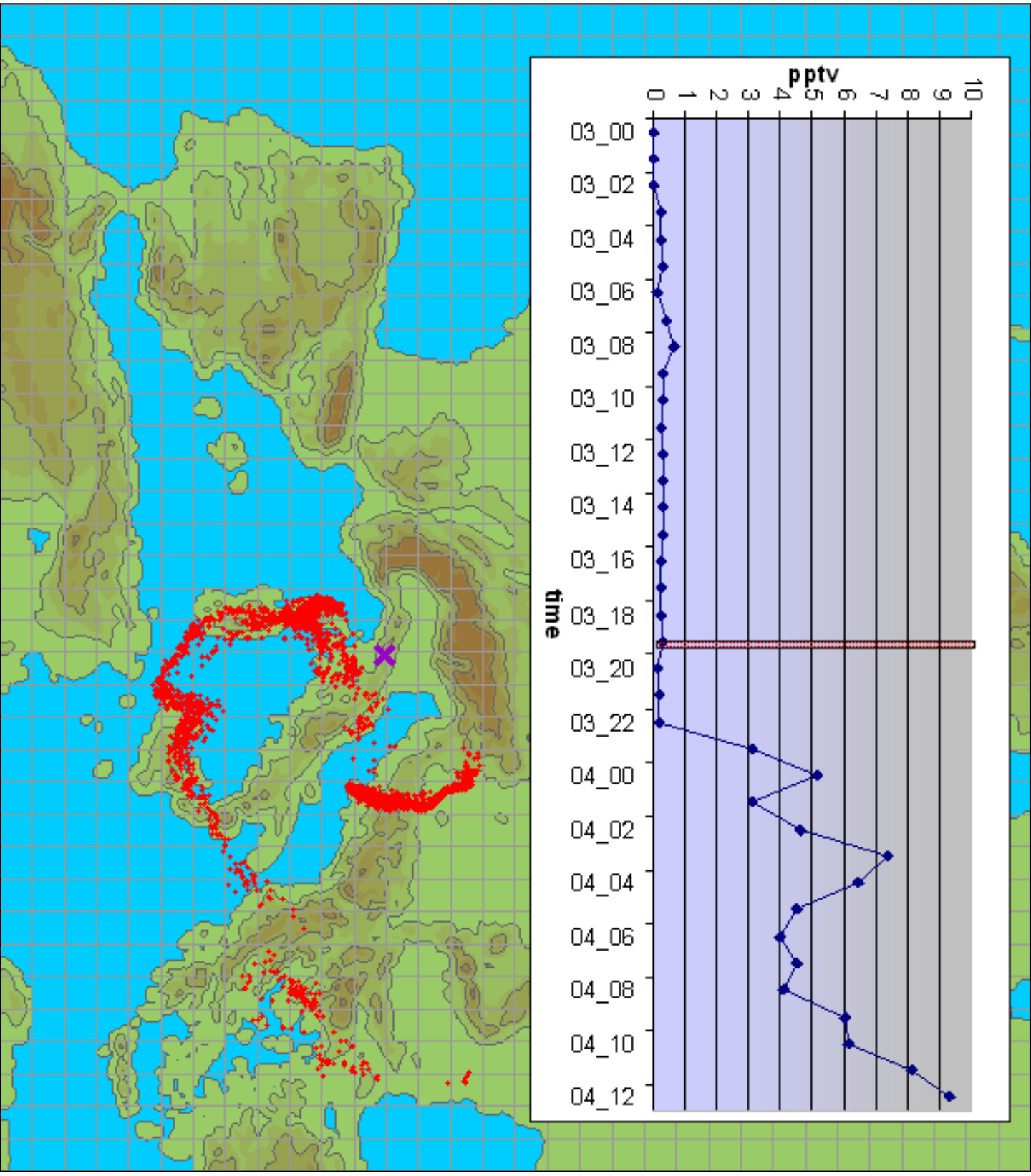
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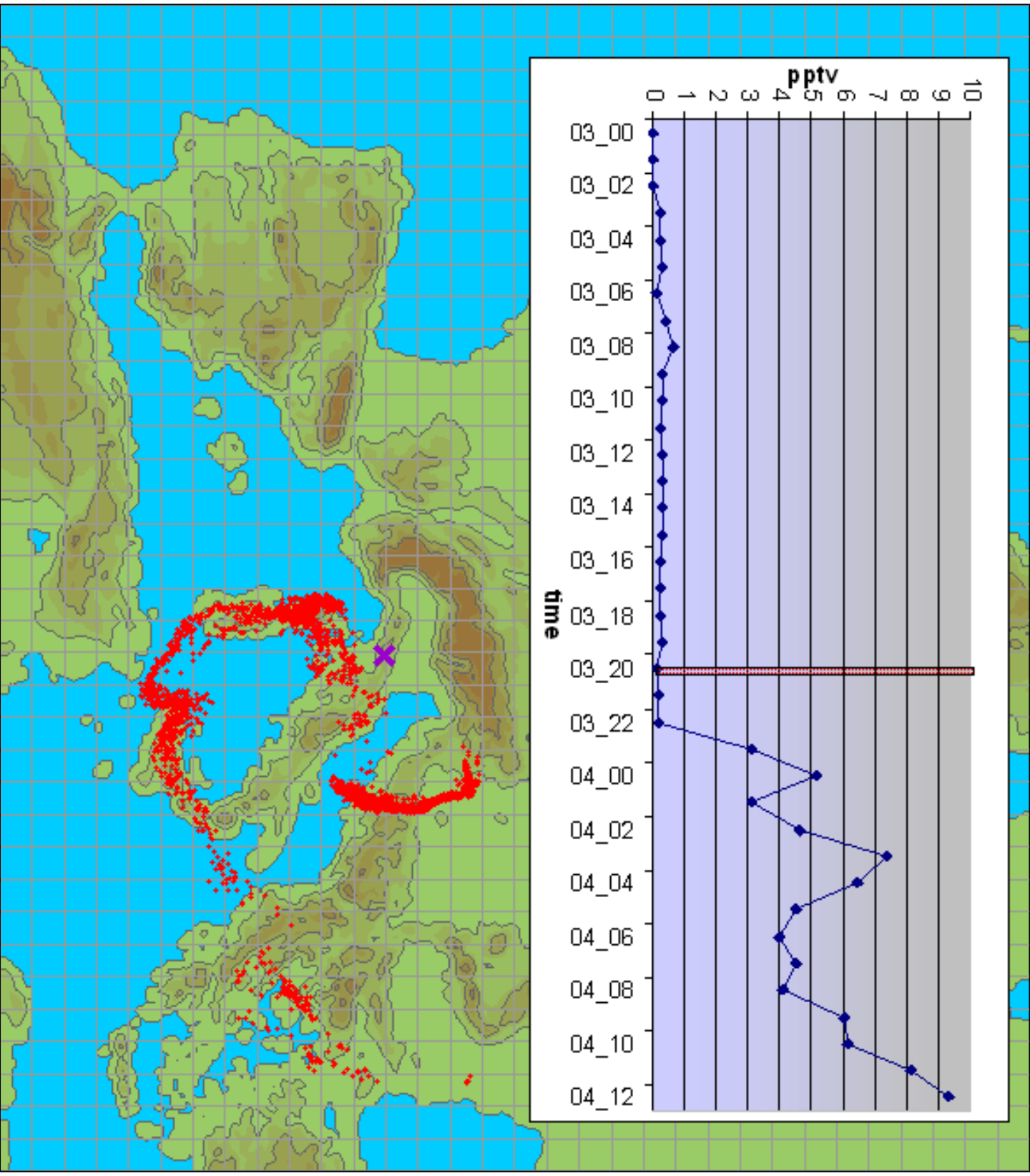
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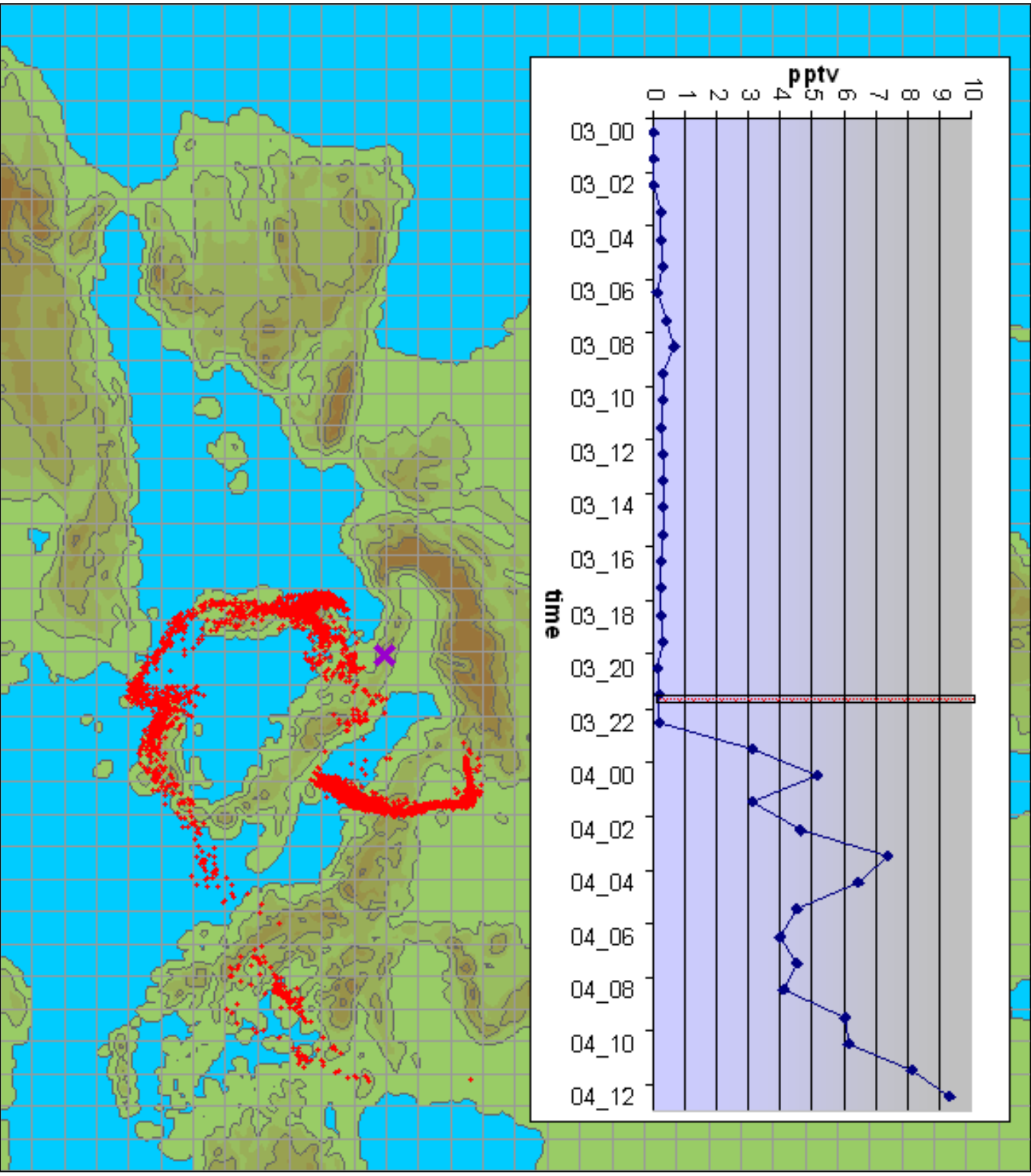
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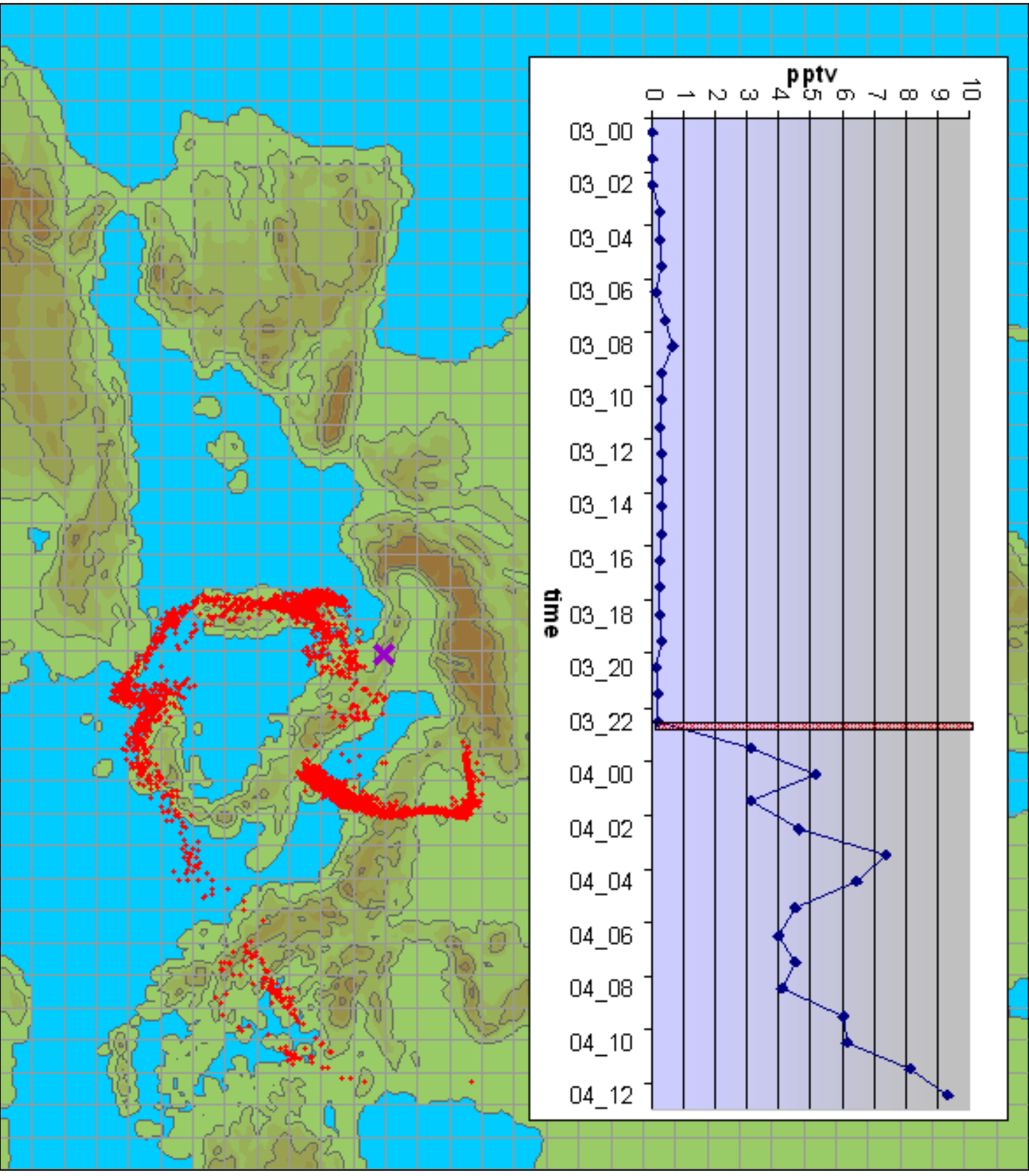
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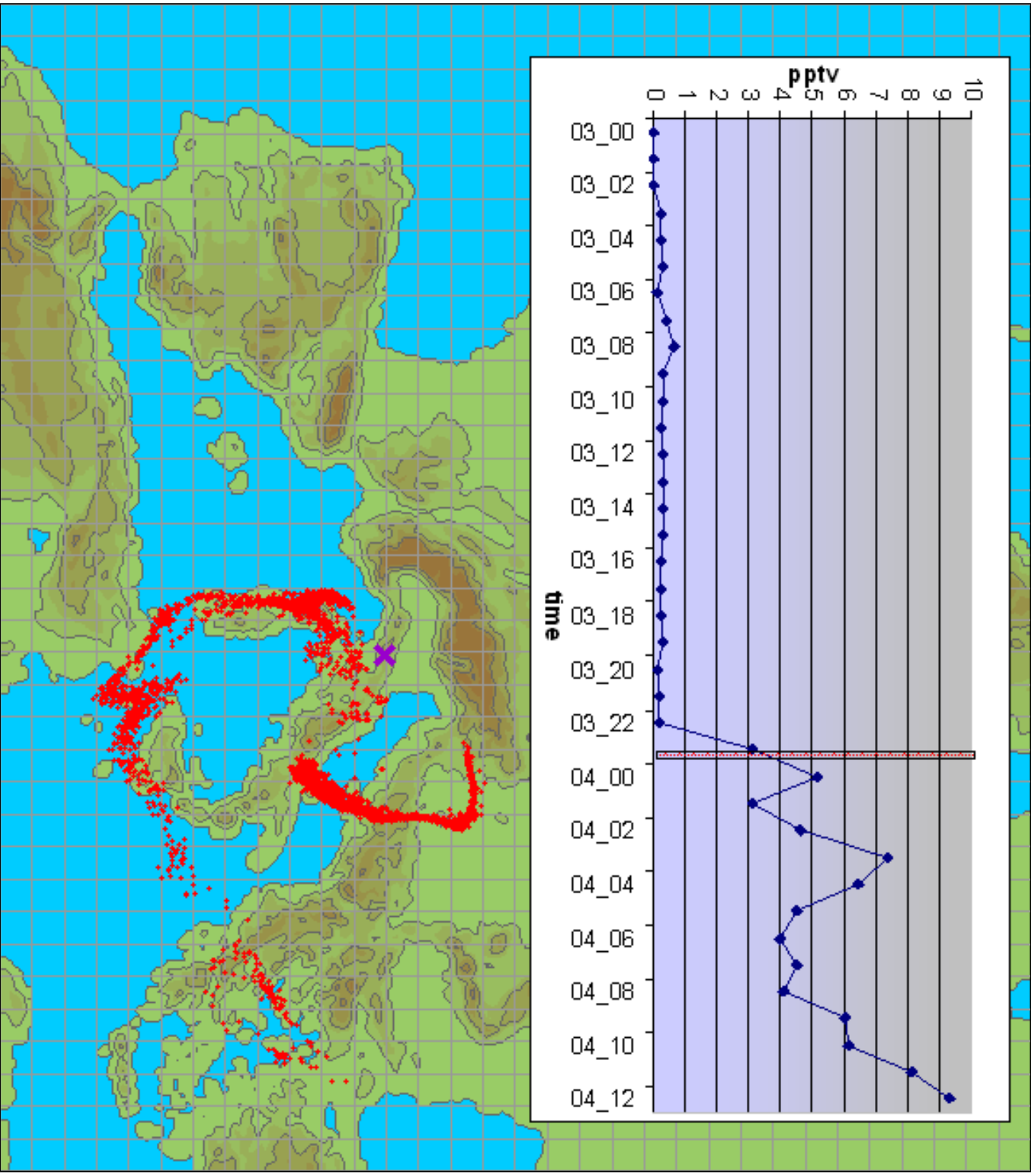
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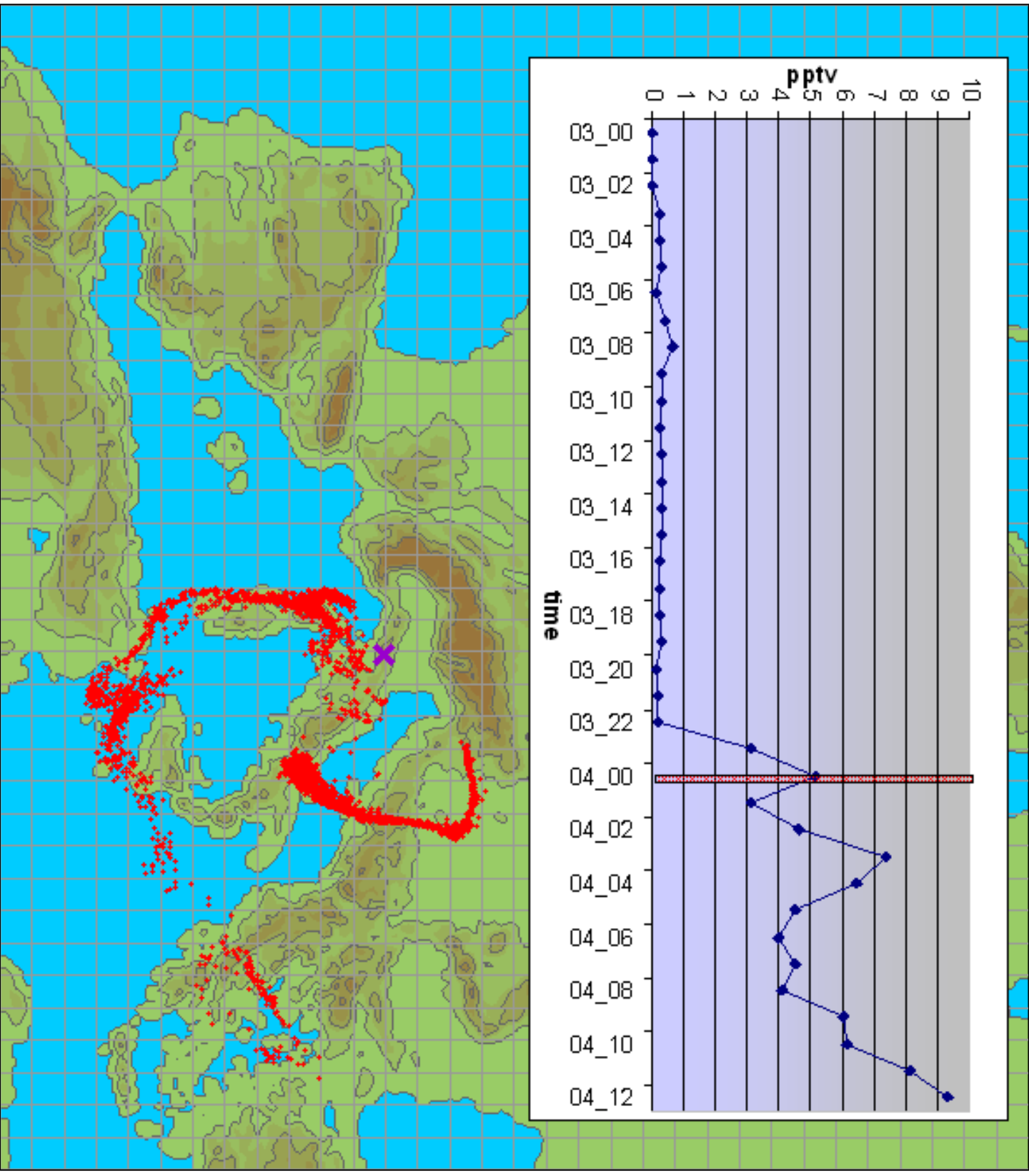
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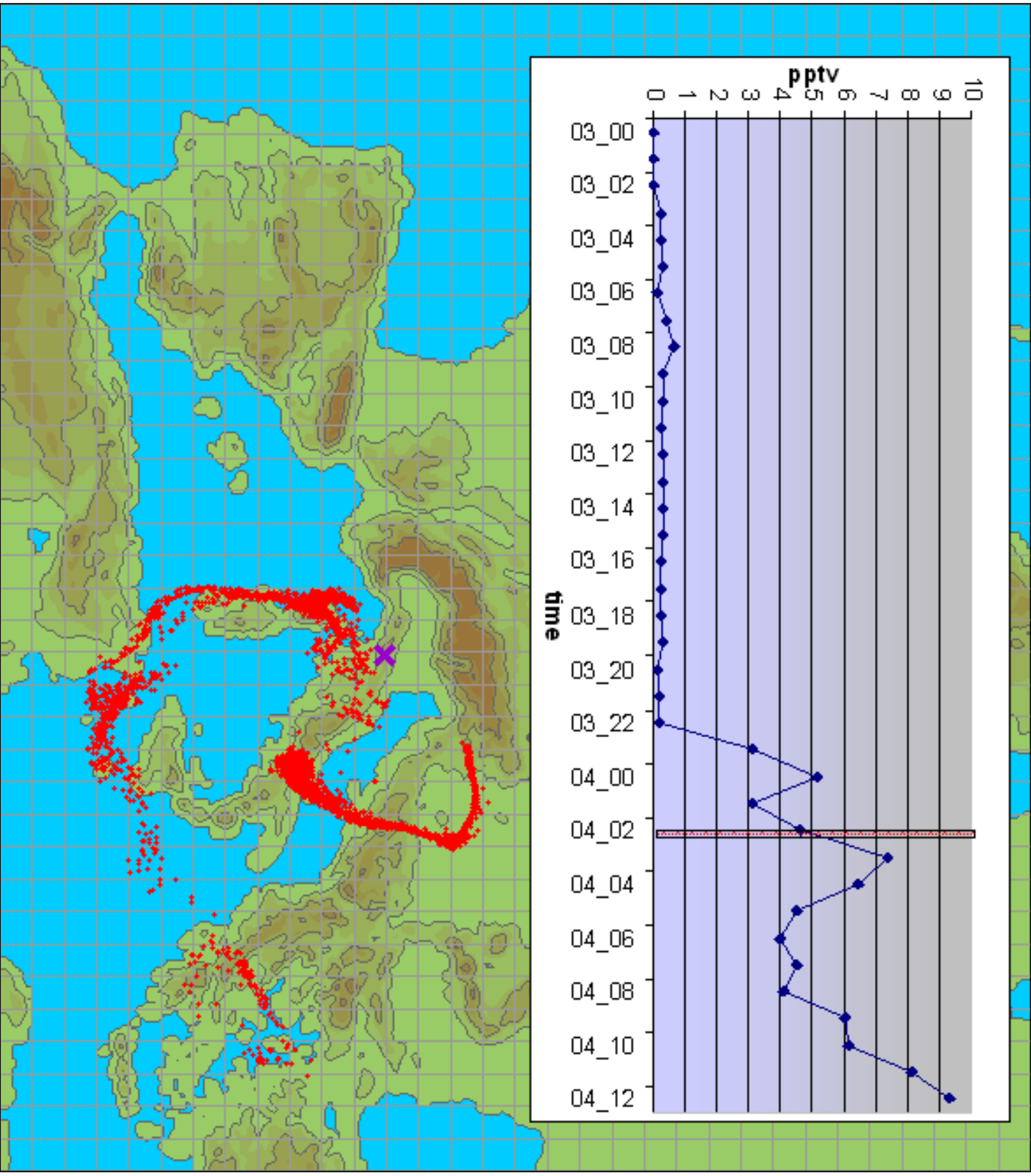
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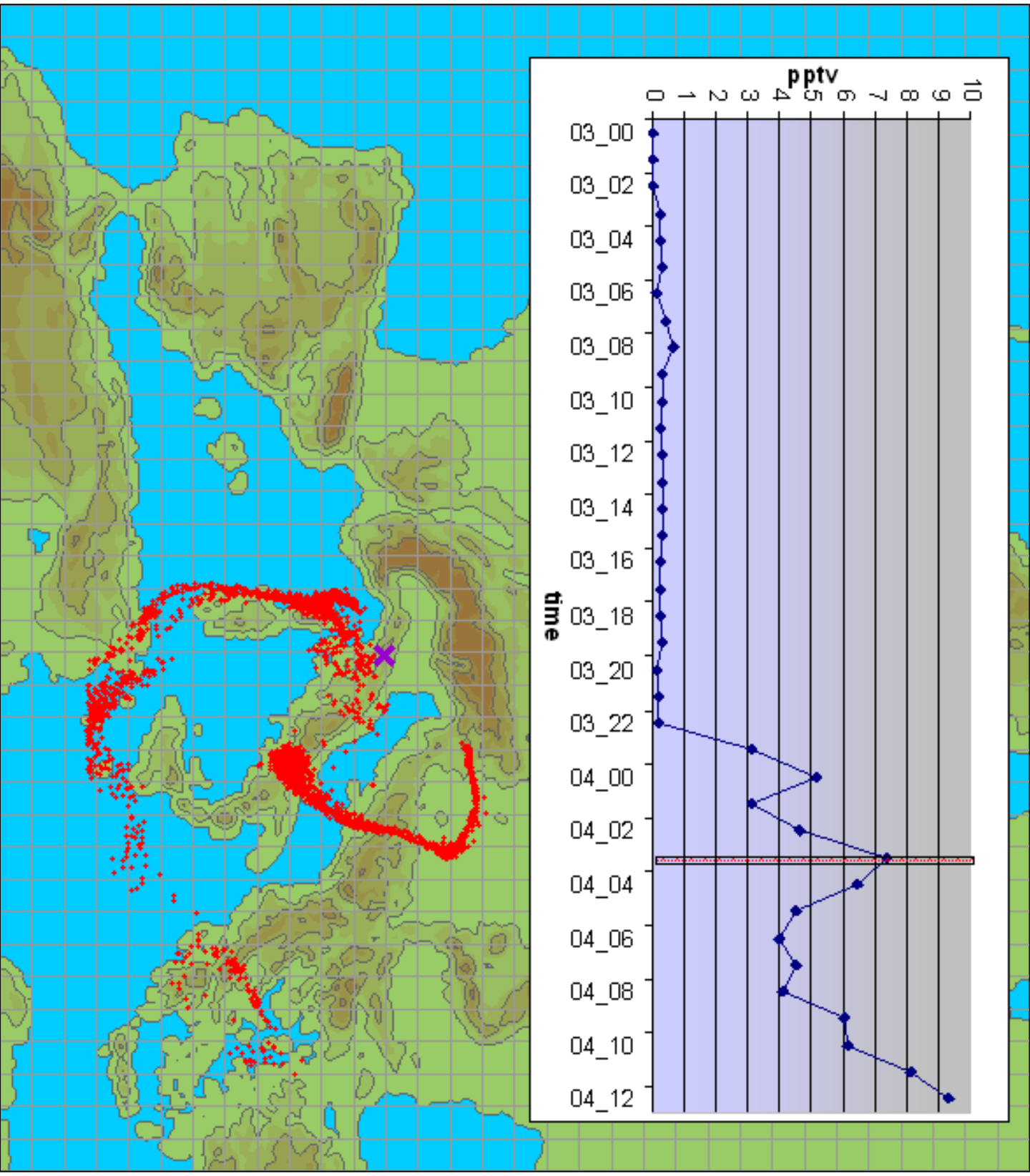
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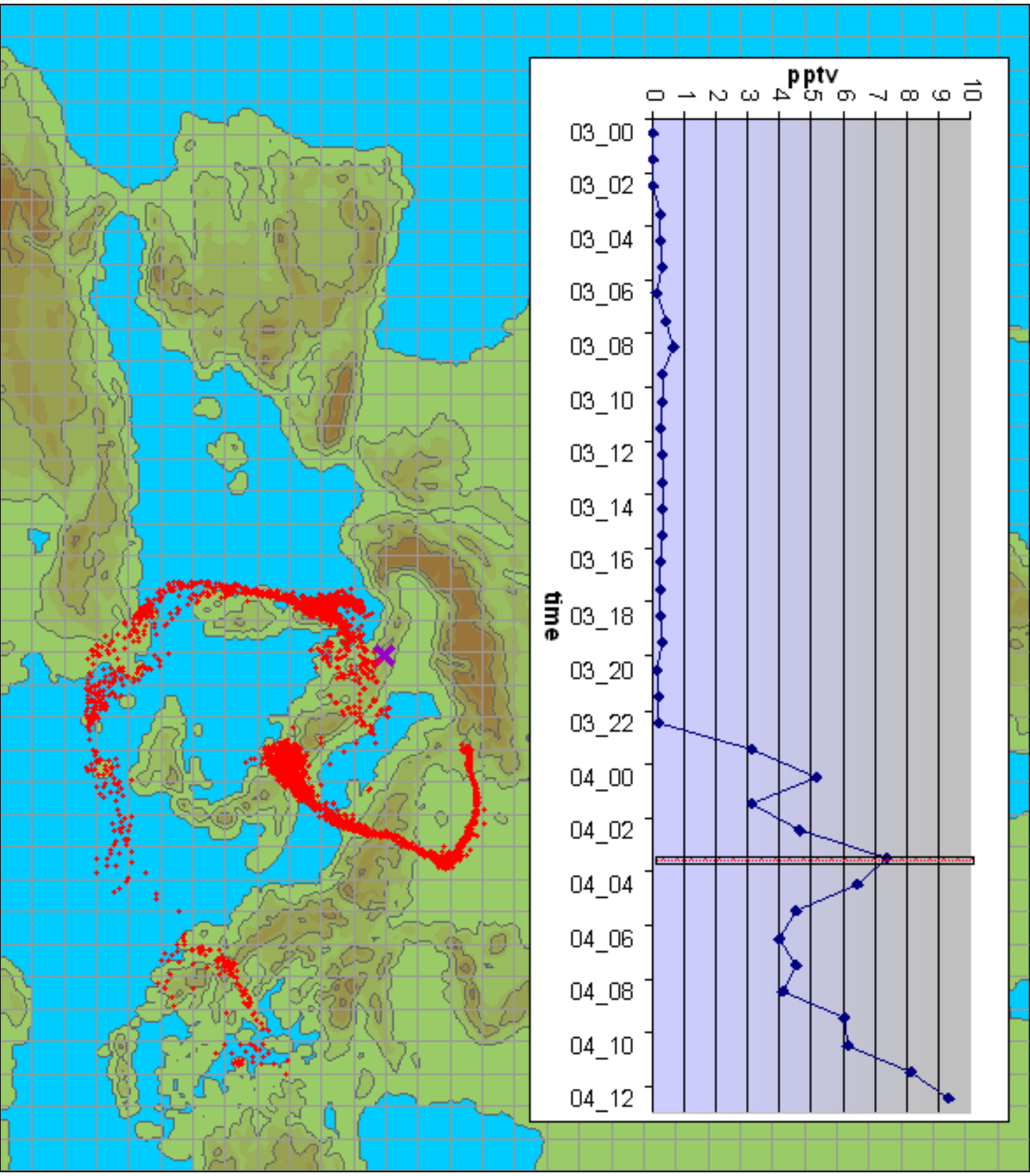
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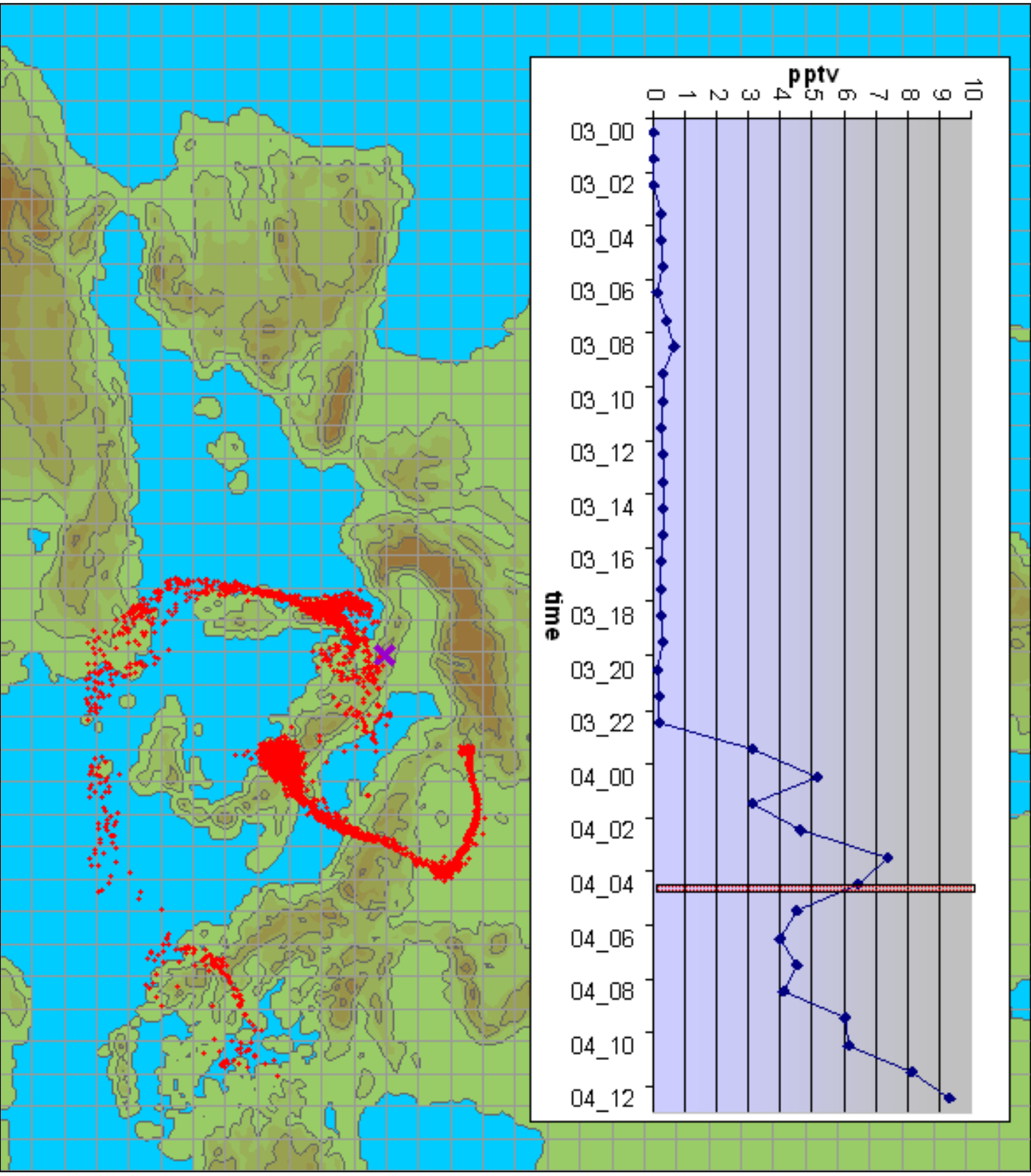
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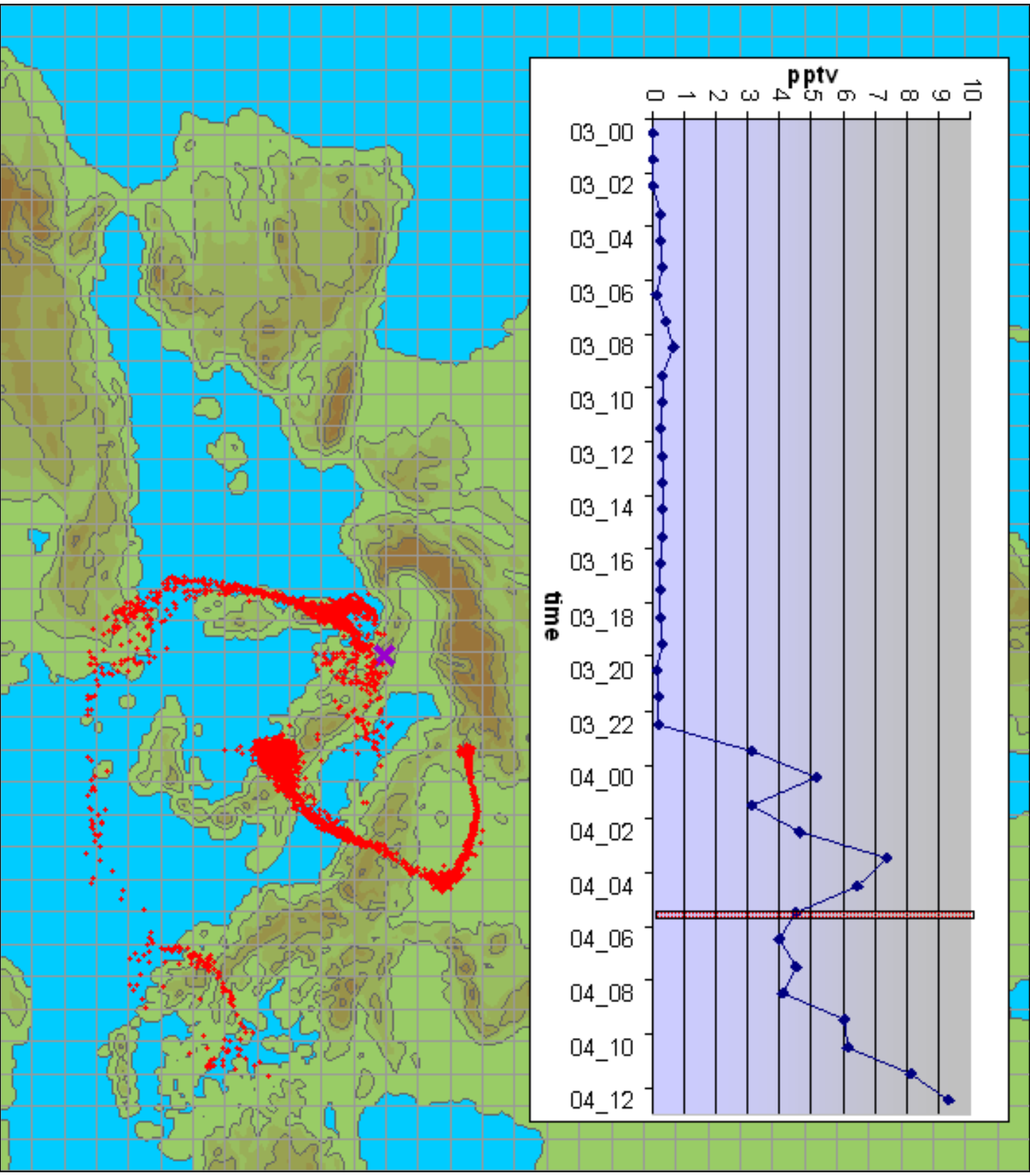
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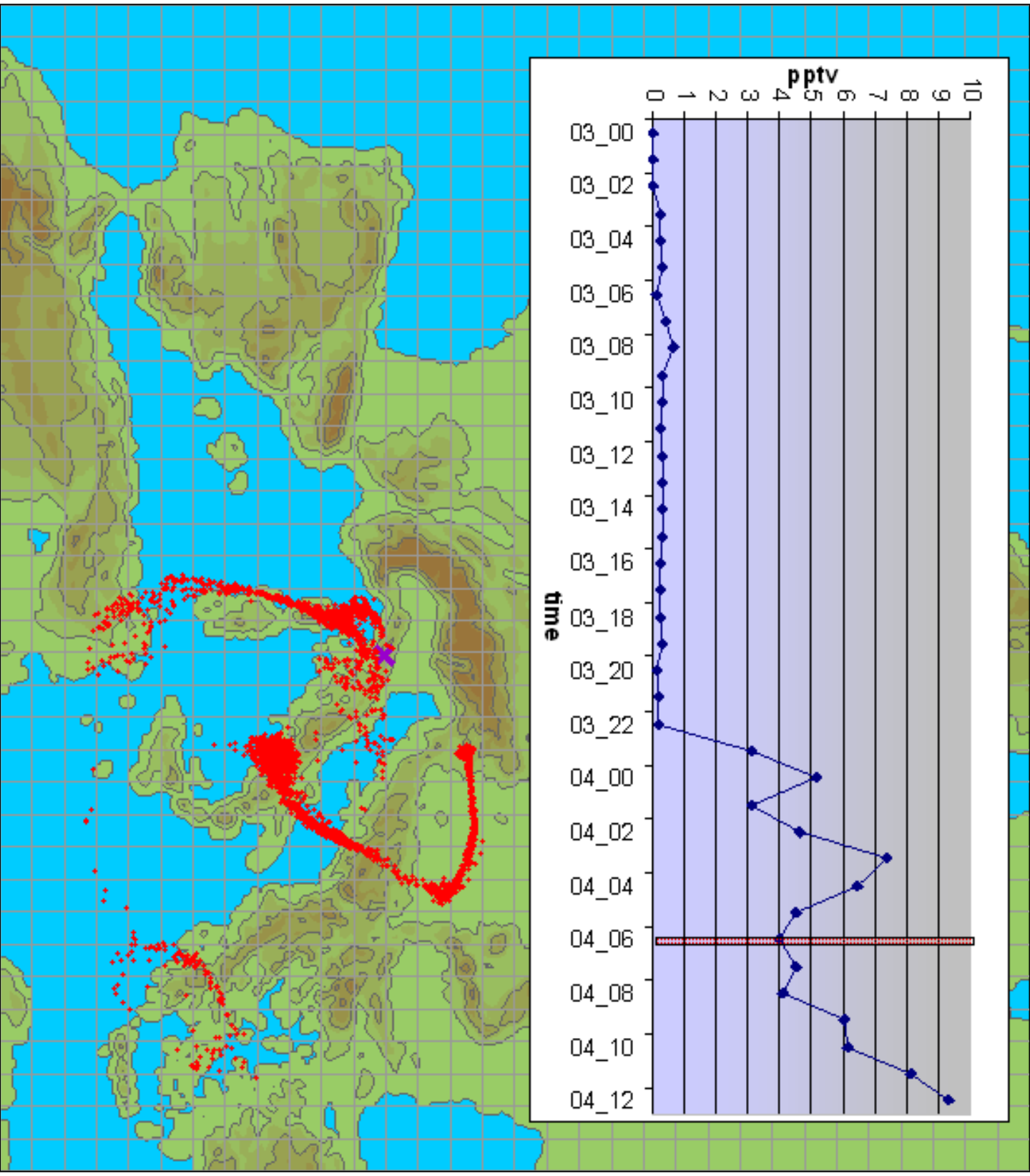
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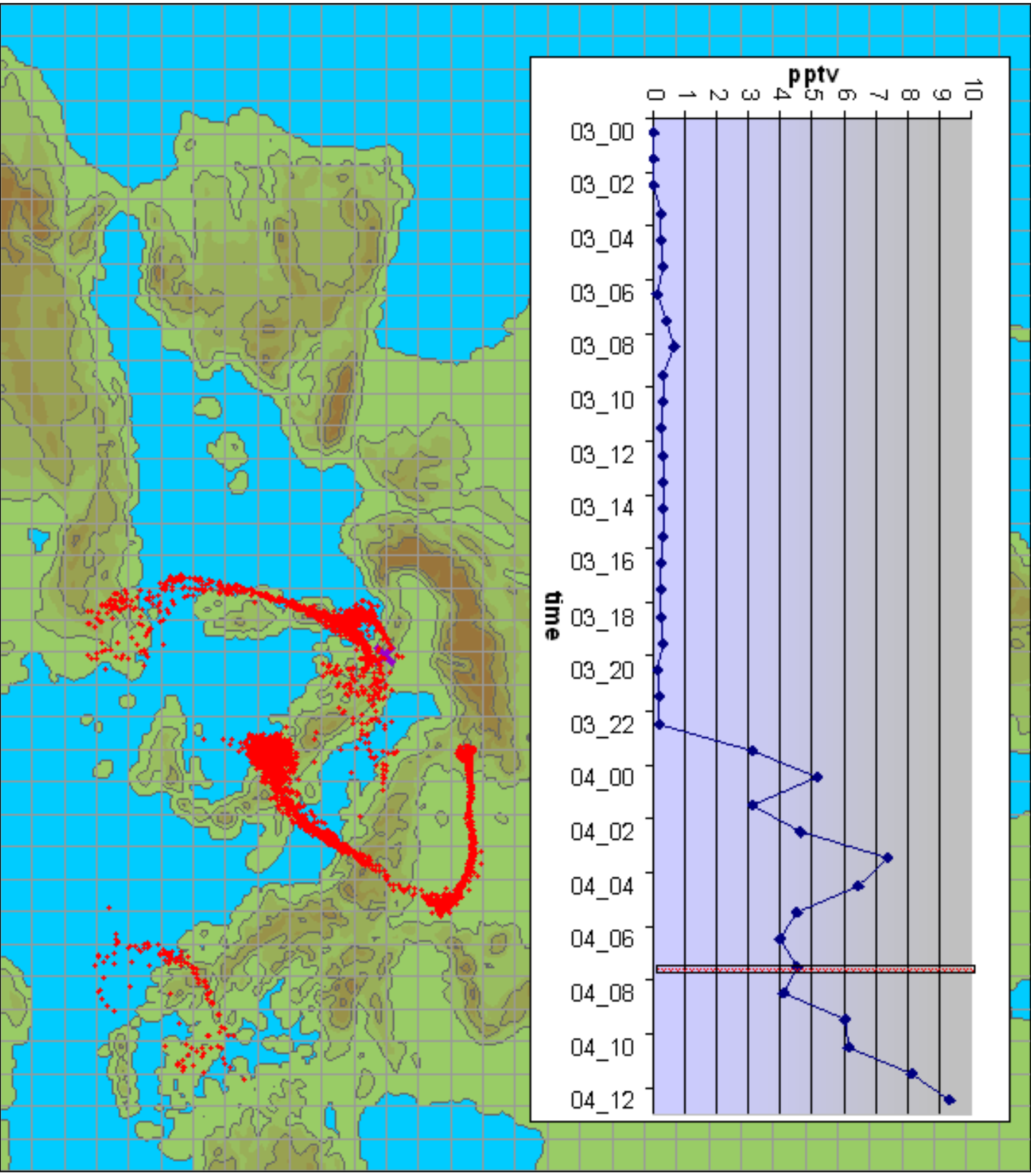
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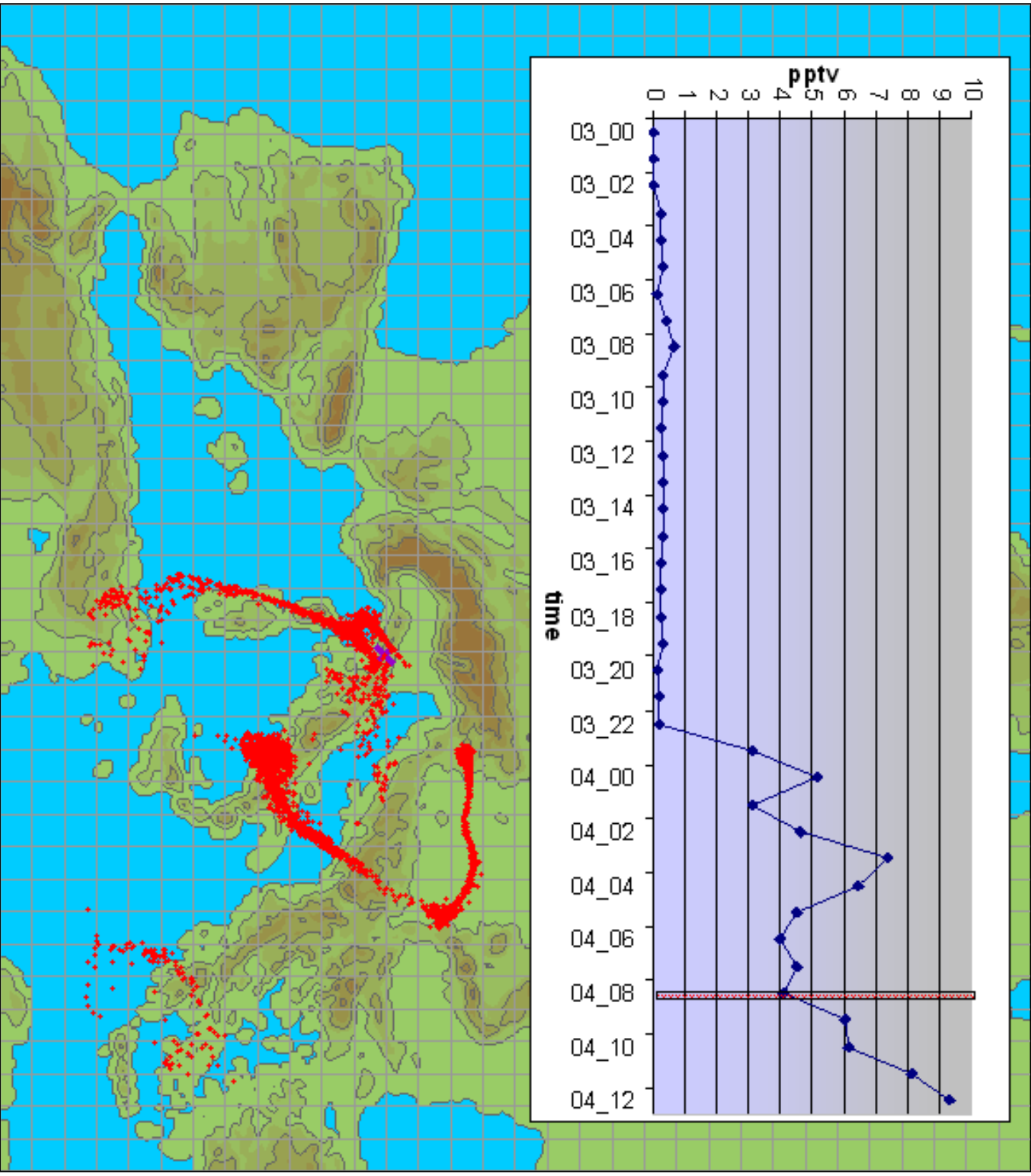
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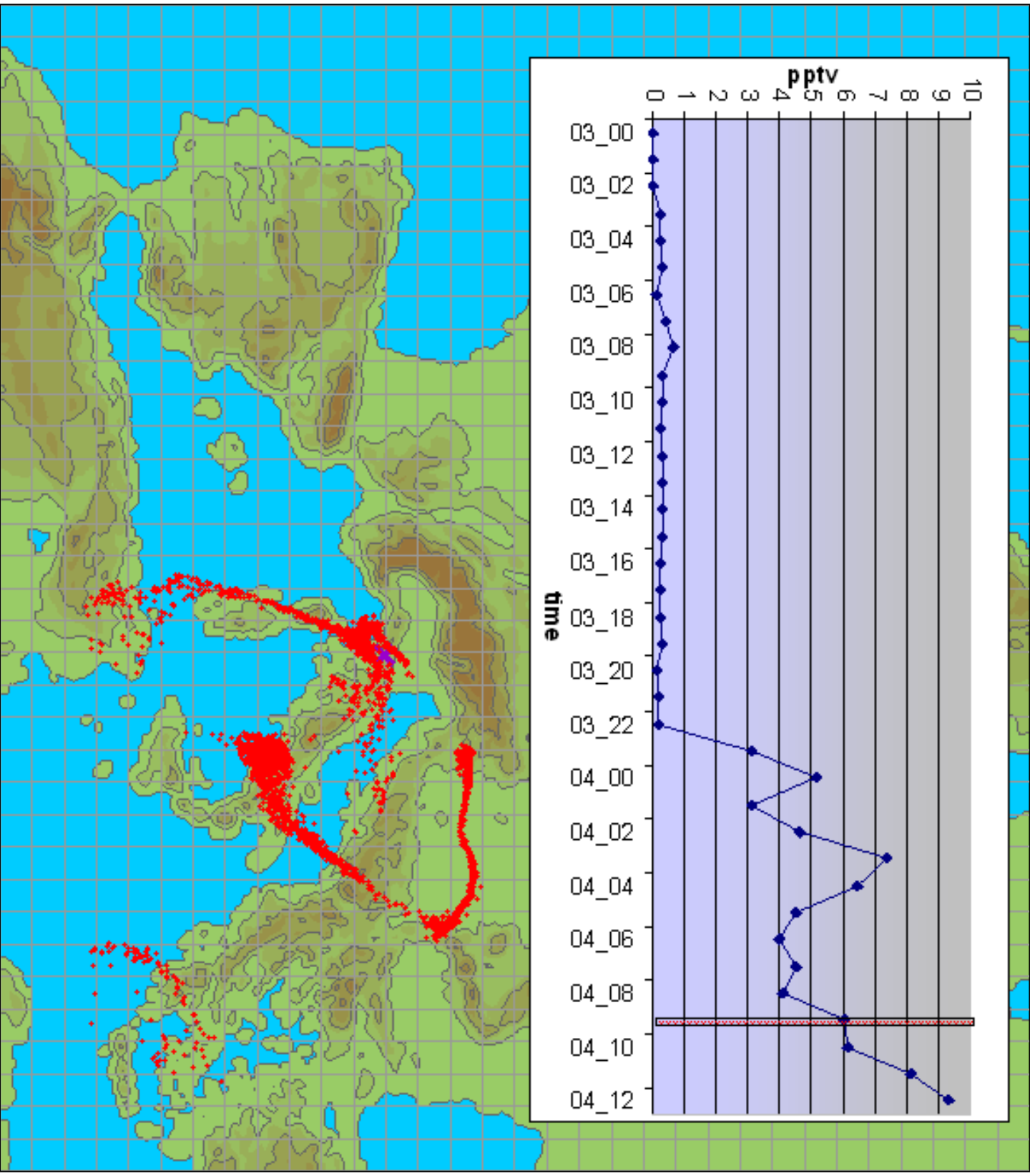
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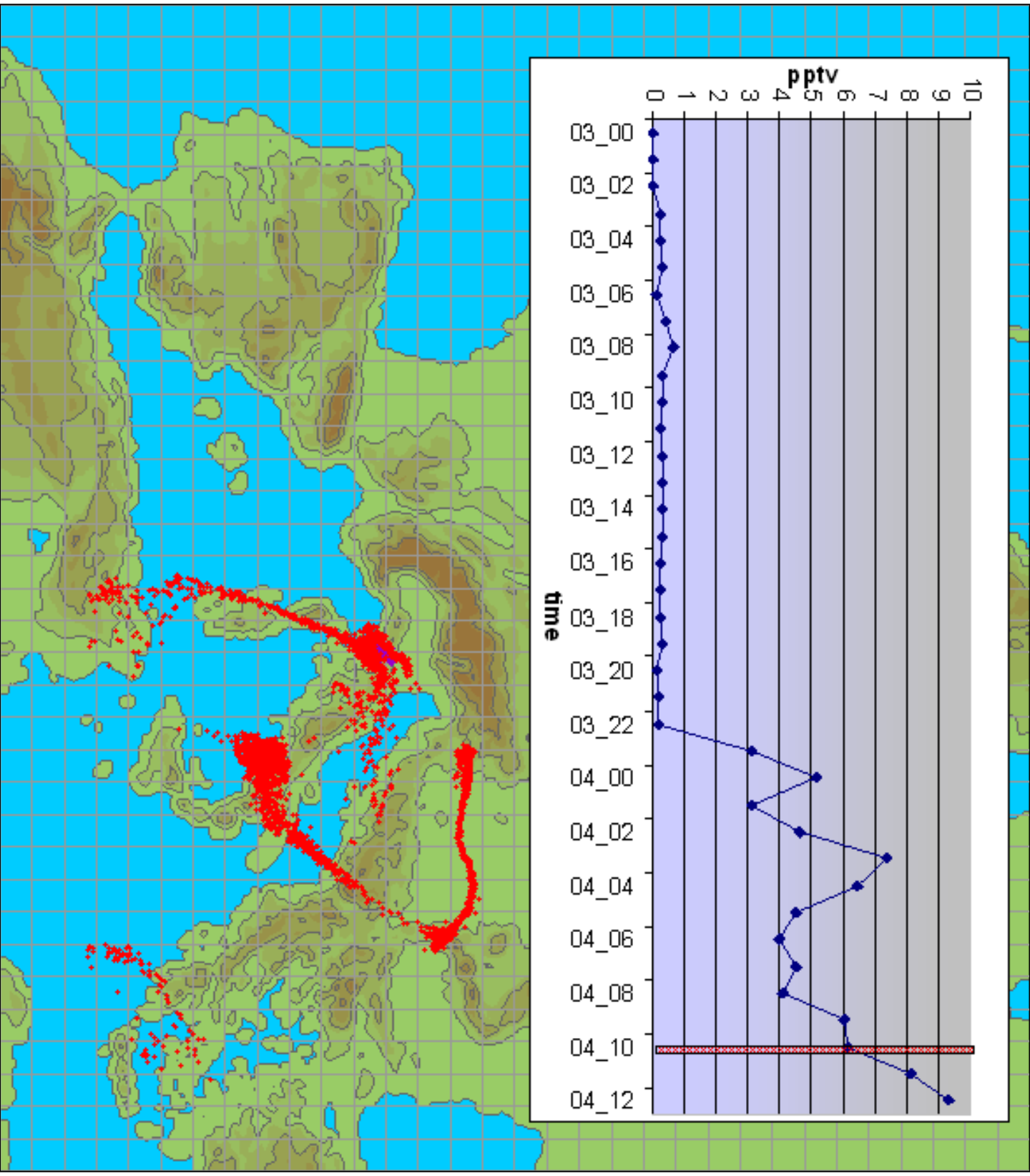
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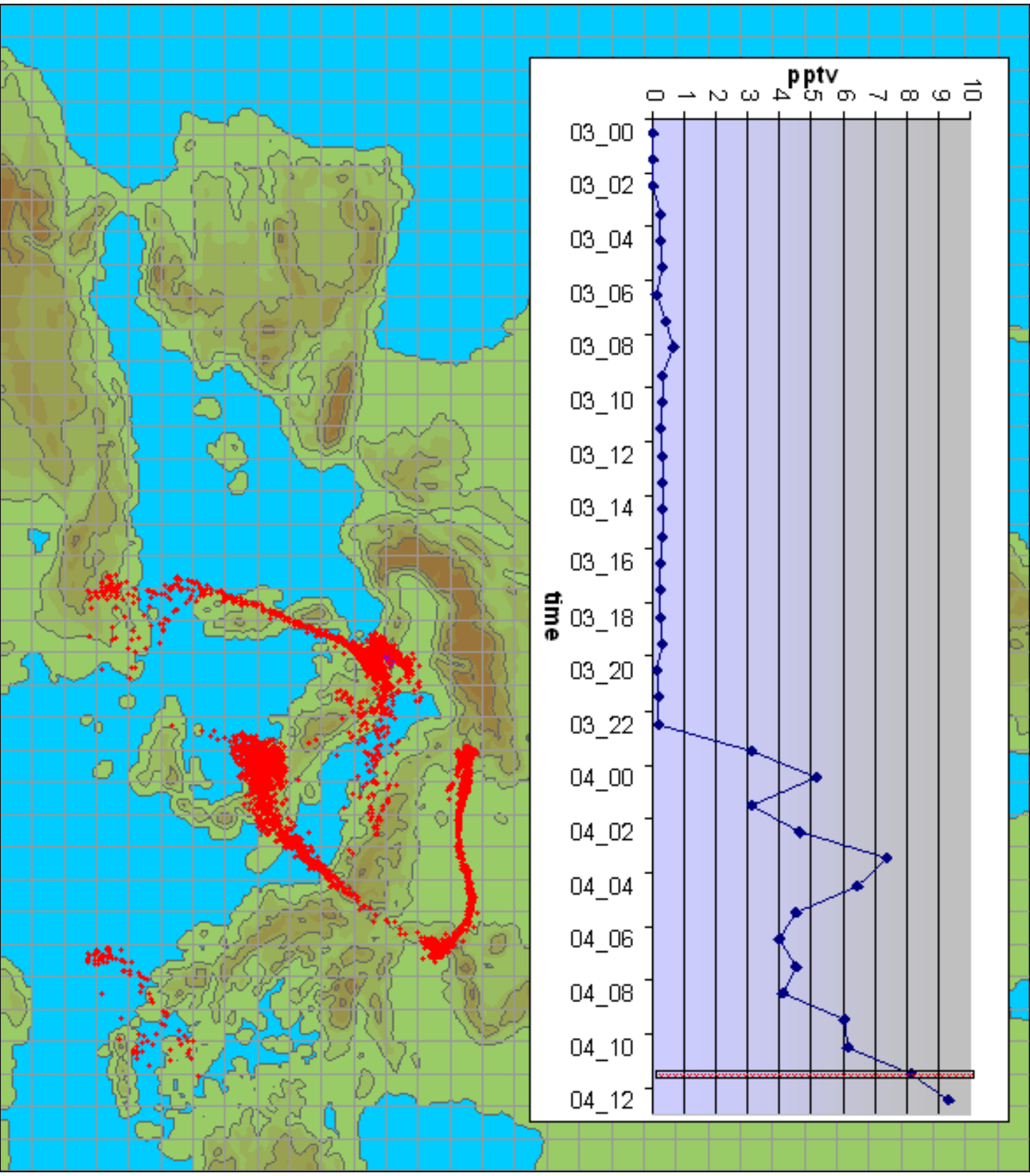
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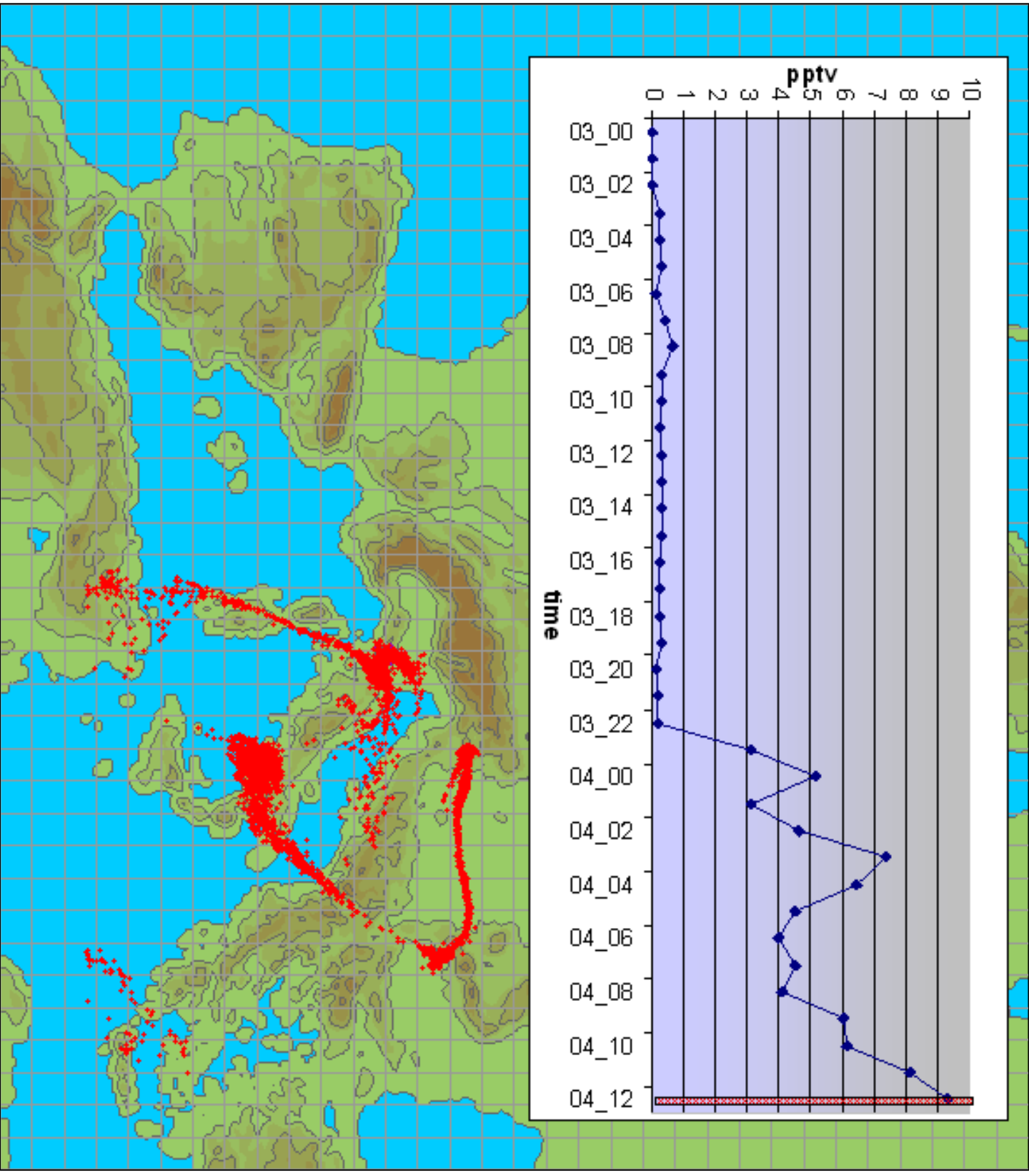
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