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Real-time determination and monitoring of the auroral electrojet boundaries

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Overview



- Background
- Auroral oval and electrojets
- •Method for obtaining the auroral electrojet
- •Agreement between aurora and electrojet?
- •AFFECTS auroral (electrojet) tracker





Background



•Deliverable 4.3: Online provision of auroral alert and tracking system.









Auroral oval







Auroal oval as seen by Dynamic Explorer I (source: NASA)

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Auroral Electrojets







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Method for obtaining the auroral electroiet





Antwerp, 11/21/2013

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Method for obtaining the auroral electrojet

•Using the Weimer 2005 electric potential and FAC model, we may reproduce the geomagnetic variation at any location at high latitudes with the exception of substorms

•Thus, we can test if a chain of magnetometers may be used to locate the boundaries of the electrojet assuming it is colocated with the sunward magnetospheric convection.







Method for obtaining the auroral electrojet





65

CGM latitude

70

15:0

55

60

Data time stamp: 30/09/2012



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Antwerp, 11/21/2013

75

80





Agreement between aurora and electrojet?

- •Several studies during the 1960s and 1970s (Walker (1964), Wellis et al. (1976), Winningham et al. (1979), Rostoker et al. 1979)
- •General agreement in location and morphology!
- •However, some systematic differences exist.
- •There is room for further studies of this, especially in the dawn sector.





Agreement between aurora and electrojet?





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From Rostoker et al. (1979) and Winningham et al. (1979)



AFFECTS auroral (electrojet) tracker



Method applied to near real-time data from the TGO magnetometer chain.
Two graphical displays and one numerical part.
The boundaries of the electrojet are determined when geomagnetic activity

is higher than 75 nT

•When Europe is in Cusp and Harang discontinuity the tracker is turned off.





AFFECTS auroral (electrojet) tracker – Example (dawn)







Data time stamp: 18/06/2012 03:00:00





AFFECTS auroral (electrojet) tracker – Example (dawn)







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AFFECTS auroral (electrojet) tracker – Example (dusk)









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AFFECTS auroral (electrojet) tracker – Example (dusk)









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AFFECTS auroral (electrojet) tracker



•Graphic displays with explanation: http://fox.phys.uit.no/AFFECTS/

•Numerical part: http://fox.phys.uit.no/AFFECTS/RT_oval_location.dat



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TROMS

AFFECTS auroral (electrojet) tracker – future possibilities

 Extend magnetometer chain southwards to be able to monitor the electrojet during severe events. Include more magnetometer chains for circumpolar determination •Figure out the cusp and Harang discontinuity regions. Include graphics of last 12 hour development.



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AFFECTS auroral (electrojet) tracker – future possibilities







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AFFECTS auroral (electrojet) tracker

- future







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Thank you!

Questions?



Photo: Njaal Gulbrandsen



