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International Communication and Coordination Related to Extreme Space Weather Events

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A. A large, complex active region quickly forms on the solar disk.

BoM / IPS Actions

- Duty Forecaster monitors situation
- Severe space weather team notified
- Issue standard HF warnings, etc
- [Issue Severe Space Weather OUTLOOK]

Customer

- Nothing
- [Heightened awareness (possibility of HF fade, SPE, ‘long-range’ notification of possible GM storm)]

Issues

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B. An X20 flare erupts with a large proton event and 2500 km/s halo CME

BoM / IPS Actions

- Run statistical models for severe storm probability based on solar observations (only)
- DF consultation with severe space weather team
- If warranted, issue **Severe Space Weather WATCH**
- Monitor SpWx email groups for TOA predictions [run TOA model in-house]

Customer

- Energy market operator (power grids):
  - Maintain increased awareness for follow-on warnings
  - Maintain increased awareness of GIC monitoring equipment levels within the power system

Issues

- No formal arrangement for exchange of TOA predictions (leverage range of forecasts)
- Limitations of non 24/7 operation. Benefits of information exchange

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C. ACE detects -100 nT Bz, with no solar wind speed information due to the proton contamination

BoM / IPS Actions

- Re-run statistical model with updated ACE information
- Auto-issue **Severe Space Weather WARNING**
- Notification to government and critical infrastructure groups through established BoM channels

Customer

- Energy market operator (power-grids):
  - Action specified in internal operating procedures based on type of warning (short duration / sustained GIC). Options include maximizing reactive power reserves, re-rating transformers, heightened awareness

Issues

- Short lead time for model running / issue of warnings
- Limitations of non-24/7 operation

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D. Ground mags show massive disturbances and calls from power grids start to come in

BoM / IPS Actions

- Auto-Issue **Severe Space Weather EVENT IN PROGRESS** (when AusDst index exceeds **-250nT**)
- DF and severe space weather team monitor event
- Manage direct communications (field calls, issue updates through SSW service and government channels as required)

Customer

- Energy market operator (power grids):
  - Monitor GIC activity
  - Manage loads in networks, as per standard operating procedures
  - Maintain lines of communication with BoM/IPS

Issues

- Responding to queries generated by international media
- Addressing differences in forecasts between agencies

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Key issues related to global coordination/communication

- Formal exchange mechanism for forecasts, eg through an open portal (≠ "consensus")

  → Standardisation of reporting metrics

- Reinforce notion of regional forecast centres

Institution (Input Time)	date	CME Time of Arrival (UT)	TOA error (hours)	Forecast IMF orientation (eg SEN)	Severe Event Probability (%) Dst<-250nT G5 or higher
BAO	27				
	28	20UT (ev #201309)	+/- 6 (ev #201309)	SWN (ev #201309)	60 (ev #201309)
	29				
IPS	27				
	28				
	29	03UT (ev #201309)	+/- 12 (ev #201309)		50 (ev #201309)
KSWC	27				
	28	21UT (ev #201309)	+/- 6 (ev #201309)	SEN (ev #201309)	50 (ev #201309)
	29				