Space Weather – A risk to economic vitality and national security, South Africa's solution

Dr Rendani Nndanganeni
South African National Space Agency (SANSA)

An entity of the Department of Science and Innovation

Email: rnndanganeni@sansa.org.za

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TIMELINE TO 24/7 OPERATIONS

2007

Member of ISES (Space Weather Community)

2010

Space Weather Regional Warning Centre for Africa

2018

Space Weather Regional Warning Centre Upgrade

2022

24/7 Operational Space Weather Centre

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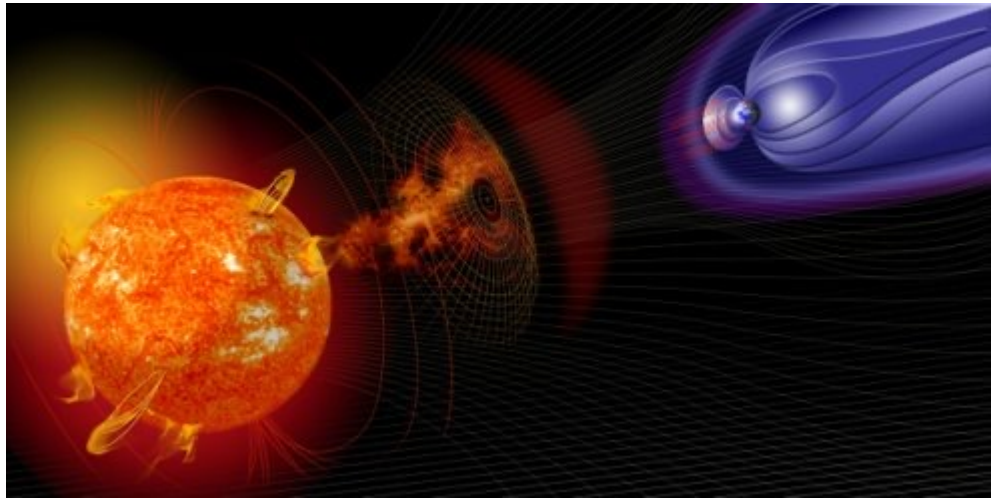
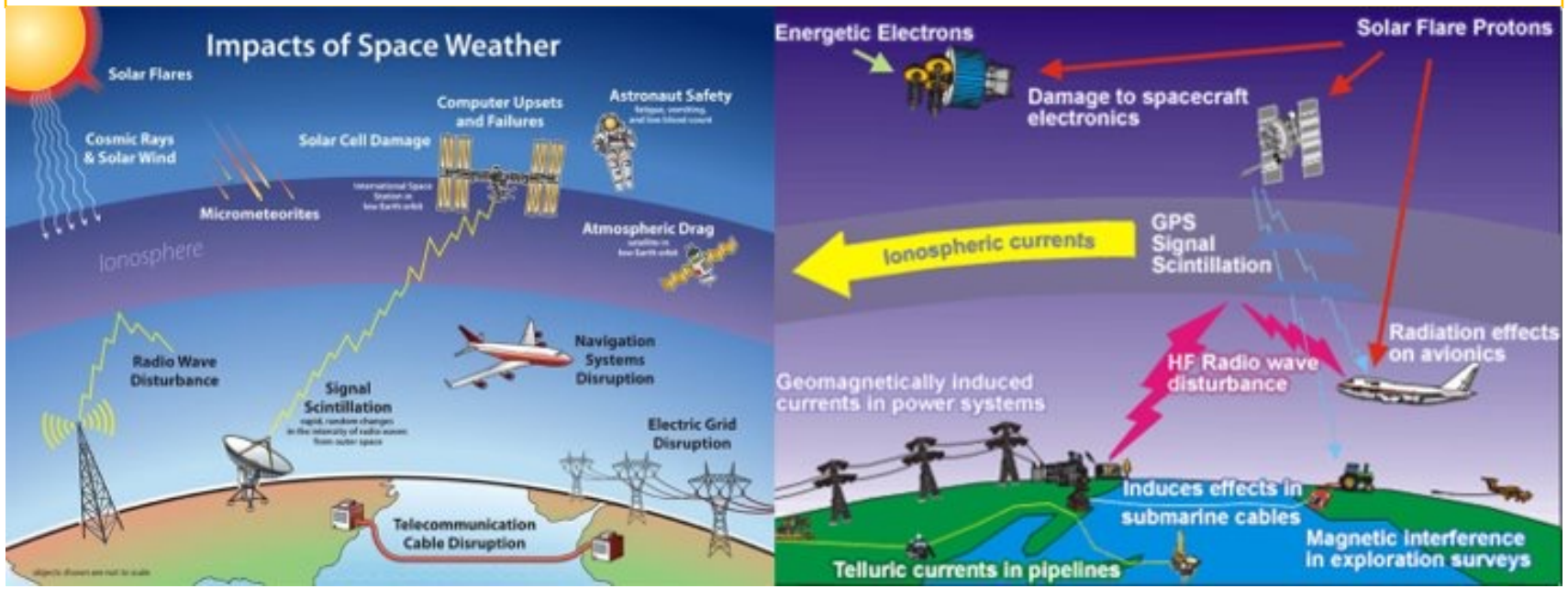
WHAT IS SPACE WEATHER?

Space Weather refers to conditions on the sun and in the solar wind, magnetosphere, ionosphere, and thermosphere that can influence the performance and reliability of space-borne and ground-based technological systems.



Space weather is a consequence of the behaviour of the sun, the nature of Earth's magnetic field and atmosphere, and our location in the solar system.

WHY SHOULD WE CARE



✓Technology continues to play an ever-increasing role in our society and the potential for space weather to impact our daily lives and the economy is growing.

✓Technological infrastructure, including the power grid, transport systems, communication, and electronic systems are vulnerable to space weather effects caused by the Sun.

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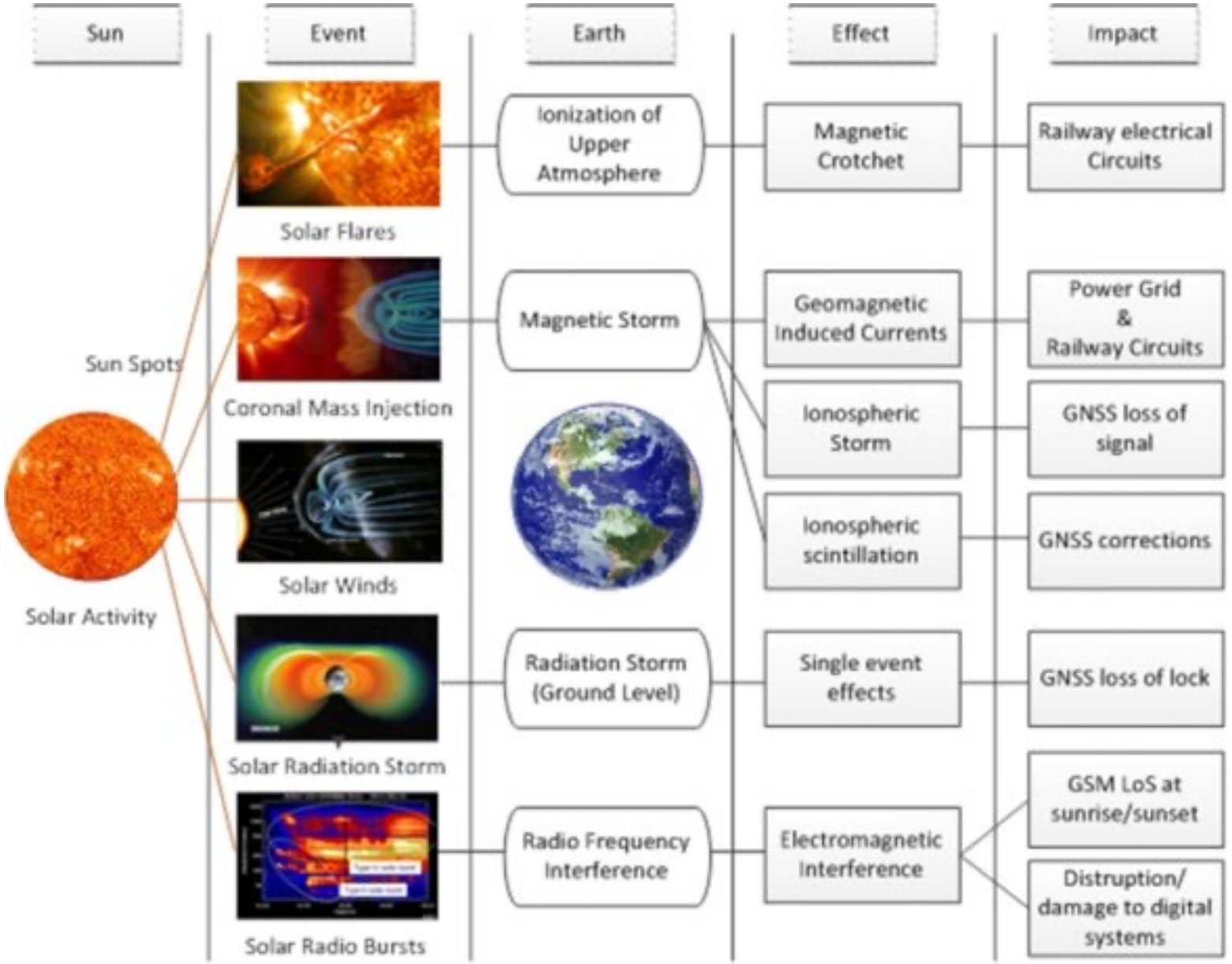
Space weather impact



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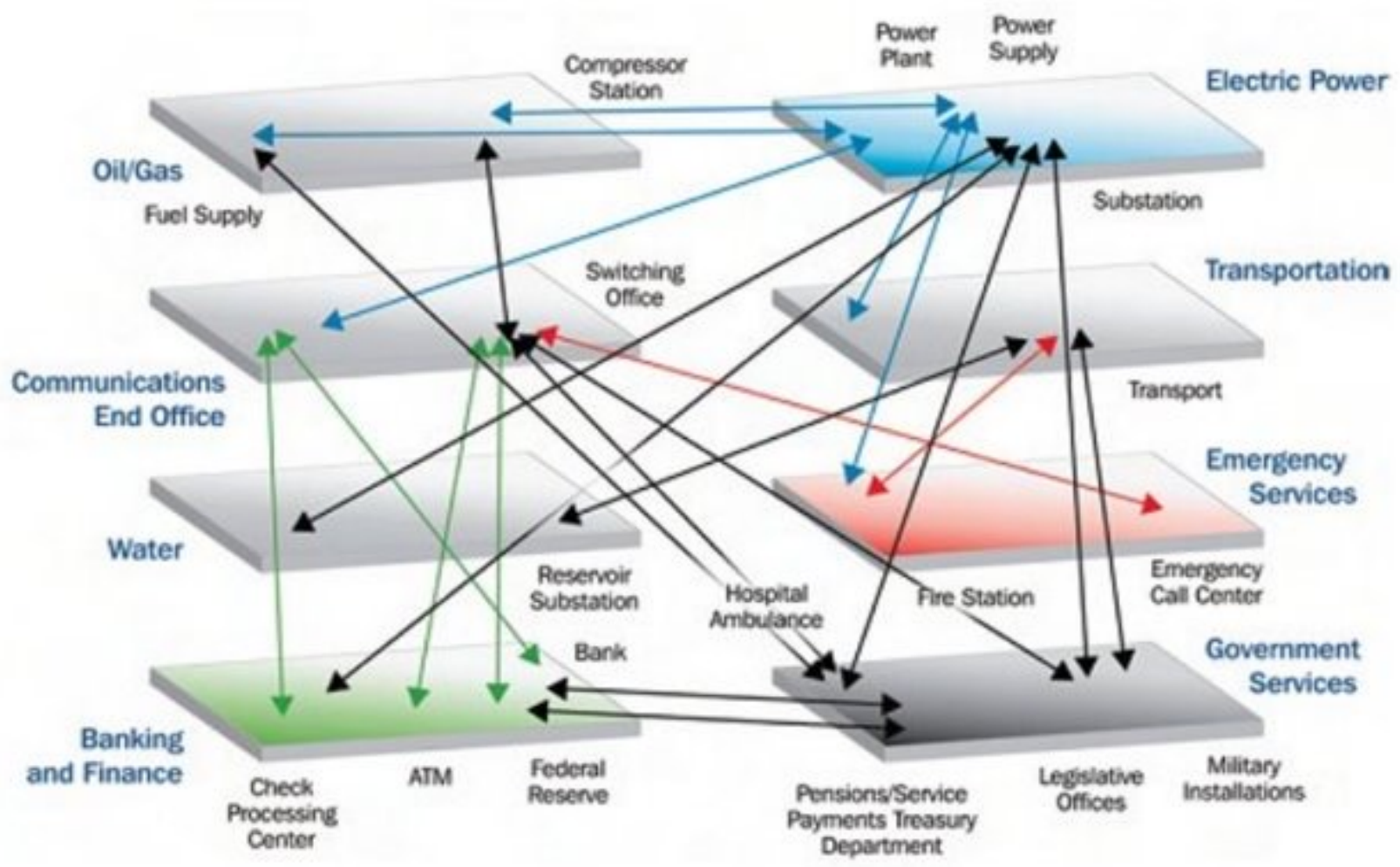
Space weather impact: Interdependencies



Space weather can lead to a cascade of catastrophic failures of power supply, emergency services, water, satellite communication, transportation, financial, and other essential infrastructure.

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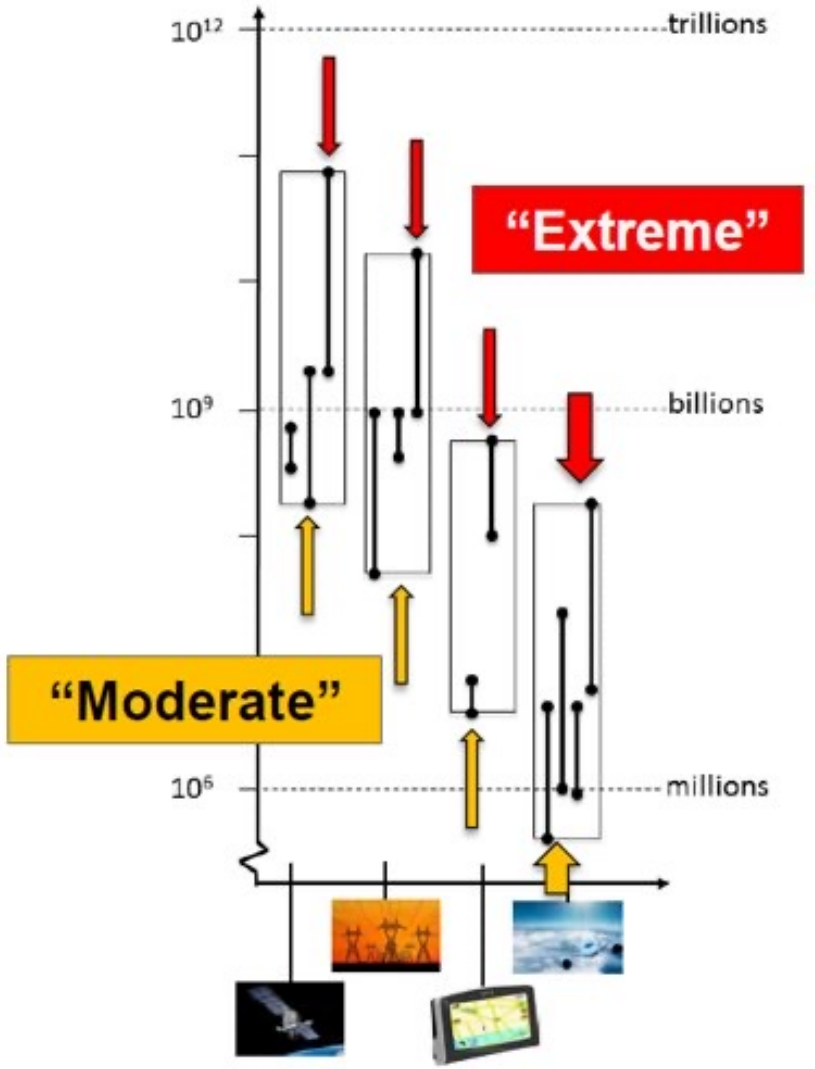
ECONOMIC IMPACT OF SPACE WEATHER



Satellite Technology
- Cost of engineering & loss of applications
- Moderate , 1 satellite
- Extreme , 10 – 100 satellites

Energy
- Wide-spread blackouts
- Moderate , R 600 million in losses
- Extreme , R 1 – R 2 trillion in losses
- Recovery could be 4 – 5 years

Communication & Navigation
- Loss of GNSS capability
- GNSS outage could cost $1 billion / day
- Can have devastating social and

Security
- Radio blackout in all cases

Transport
- Aviation, rail, maritime
- Severe economic repercussions

SPACE WEATHER AS A NATIONAL RISK

Figure 2: Risks of natural hazards and major accidents

UK RISK REGISTER RISK MATRIX

Impact score based on

- Fatalities
- Injuries/illness
- Social disruption
- Economic harm
- Psychological impact

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https://www.gov.uk/government/publications/national-risk-register-of-civil-emergencies

DEVELOPING A CAPABILITY

Provide 24/7 operational space weather services to the African region

- ✓ develop capability
- ✓ derive economic benefit
- ✓ provide a national platform
- ✓ ensure credibility
- ✓ fill the expertise gap
- ✓ provide quality services
- ✓ contribute to the knowledge economy
- ✓ create opportunities & partnerships
- ✓ increase the value proposition of space science

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SPACE WEATHER SOLUTIONS

Provision of space weather information and forecasting

Expertise and prediction in HF communications

Information related to impacts on navigation applications

Space Weather research into impacts and forecasting

Needs analysis and impact studies

Advice and information on how to best utilise space weather information to mitigate the impacts

Space Weather Training for industry

24/7 Operational Space Weather Centre

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HUMAN CAPITAL DEVELOPMENT

Forecasters

- Training and development of competent professional forecasters
- Target is unemployed graduates who have an honours degree in Physics or Meteorology
- 4 trained during the project and 3 are currently in training– target is 12

Science Advocacy

- Space Weather inspires and creates excitement in science and technology
- Content is utilized by Science Engagement team
- Science Communication has been key driver to creating awareness
- Building a pipeline (career models, inspiration)

NATIONAL PARTNERS

- ✓ Air Traffic and Navigation Services (ATNS)
- ✓ South African Weather Services (SAWS)
- ✓ Department of Transport
- ✓ National Universities

- ✓ A **National Space Weather Working Group** under the ATMS ATM/cns implementation committee was set up in 2018 to coordinate national efforts to implement the ICAO Space Weather Information requirements

INTERNATIONAL STATUS

Member of International Space Environment Service

Designated ICAO Regional Space Weather Information Provider (one of 5 designated providers globally)

Co-Chair of WMO Expert Group on Space Weather

Leading Space Weather Voice for Africa - SANSA is leading the AFI Region project for the African Aviation Sector

International Prestige for Research to Operations in Space Science

CONCLUSIONS

- ✓ Technology dependencies, and is a risk to the 4IR
- ✓ Space Weather affects safety of live principles for aviation operations, and compliance with ICAO is now a requirement
- ✓ SANSA is addressing operational capability for Space Weather information provision as a service to the African region
- ✓ SANSA will continue to utilize its existing capability and global networks to ensure that the most optimum solution for dealing with the threat of Space Weather is developed for the continent
- ✓ SANSA will continue to partner with the various role players to ensure an adequate readiness level on both sides (provider & user) for space weather information

Thank you

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http://spaceweather.sansa.org.za
http://research.sansa.org.za

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