# Vanuatu Risk Profiling

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Background

- part of Risk Governance Assessment on Strengthening Climate and Disaster Risk Governance in Vanuatu

- supported by the Pacific Risk Resilience (PRR) Programme, implemented by UNDP

- focusses on strengthening governance mechanisms for DRM and CCA at the national, sub-national and local levels

- assesses risks from geo-hazards and climate change
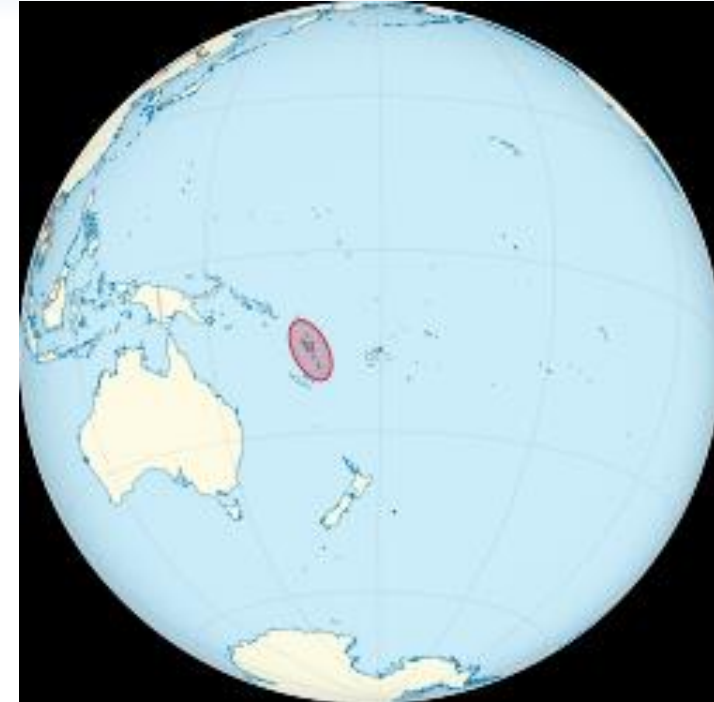
Vanuatu

Vanuatu

Country

Vanuatu, officially the Republic of Vanuatu, is an island nation located in the South Pacific Ocean. Wikipedia

Capital: Port Vila

Currency: Vanuatu vatu

Prime minister: Moana Carcasses Kalosil

Population: 247,262 (2012) World Bank

Official languages: French Language, English Language, Bislama Language

Government: Unitary state, Parliamentary republic, Republic

Vanuatu climate change

Climate change influences both the climate and the weather. Climate can be seen as the long-term average weather: "Climate is what you expect, weather is what you get". The change in climate expresses itself as a slow change in average values. The change in weather expresses itself as a much faster change in extreme events.

The following table lists the effects of climate change that are considered in this assessment.

climate change	long term effects (climate)	short term effects (weather)
temperature increase	higher Tmin, Tmean, Tmax	heat waves, cold spells
precipitation change	less or more annual rainfall	floods, droughts
sea level rise (NB. vertical land movement)	higher sea levels, compounded by higher wave-setups	higher flood extremes
ocean acidification	increase with atmospheric CO_2 levels	
sea surface temperature increase	higher min, mean and max SST	more and longer episodic high temperatures

Analysis background

This risk profile report uses outputs derived from SimCLIM 2013 for the climate change projections, which applies AR5 model results. It is currently the only source available for such an analysis.

Results are from an ensemble of climate change models, using the median from all models available. The number of available models varies with the climate variable. Changes are expressed against the new climate baseline for 1981-2010, as defined in AR5.

RCP8.5 is selected as the worst case emission scenario, combined with a high climate-sensitivity.

Depending on the risk factor focussing on the long term (slow change of climate) or the shorter term (faster change in weather characteristics), time-horizons are set differently.

Where relevant, results are presented for three locations, at the northern part of Vanuatu (Torba), in the middle (Shefa), and for the south (Tafea).

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All temperatures will increase with marginally different values. The increases are lower than the global averages (2040: 1.88°C, 2070: 3.56°C), which is due to the fact that Vanuatu is surrounded by ocean, tempering the changes.

Temperature increase compared to baseline climate (1981-2010):

Location	2040			2070		
	Tmin	Tmean	Tmax	Tmin	Tmean	Tmax
North	1.22°C	1.22°C	1.23°C	2.32°C	2.33°C	2.33°C
Efate	1.20°C	1.21°C	1.20°C	2.28°C	2.30°C	2.28°C
South	1.21°C	1.22°C	1.20°C	2.29°C	2.30°C	2.28°C

Extreme temperature changes

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Current extremes as well as by 2040 (from an ensemble of 40 AR5 models), for 1 and 5-day period and a 20 year return period are:

| Location	current		2040	
	1-day RP20	**5-day RP20**	**1-day RP20**	**5-day RP20**
North	33.4°C	32.5°C	34.7°C	33.8°C
Efate	34.7°C	33.6°C	35.9°C	34.8°C
South	33.6°C	32.9°C	34.8°C	34.1°C

The changes for the 20 year return period under climate change by 2040 are:

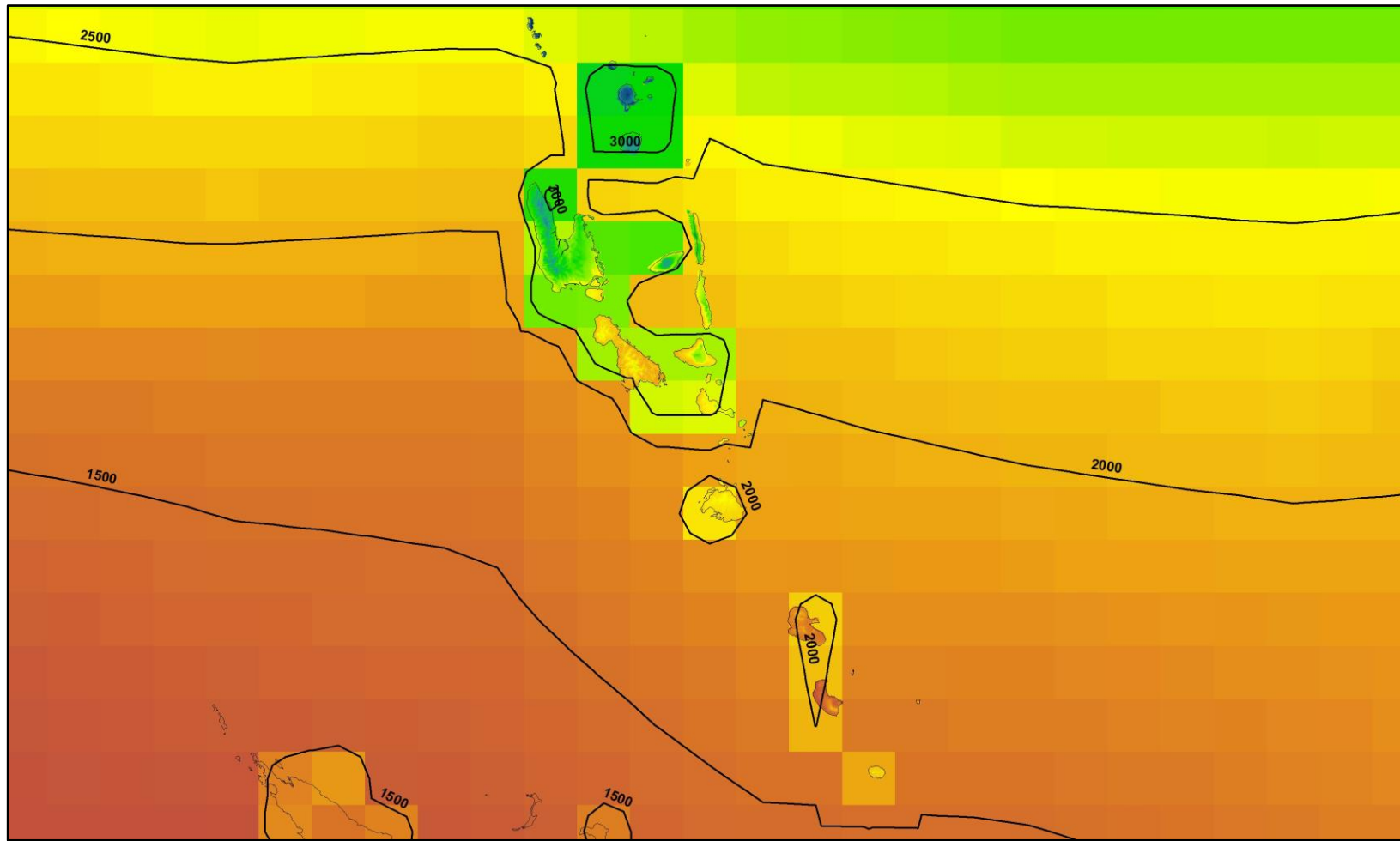| Location	1-day RP20	5-day RP20
North	1:1.1 year	1:1.1 year
Efate	1:2.3 year	1:2.0 year
South	1:1.7 year	1:2.1 year

Sea surface temperatures

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Spatial distribution of Sea Surface Temperatures during February/March:
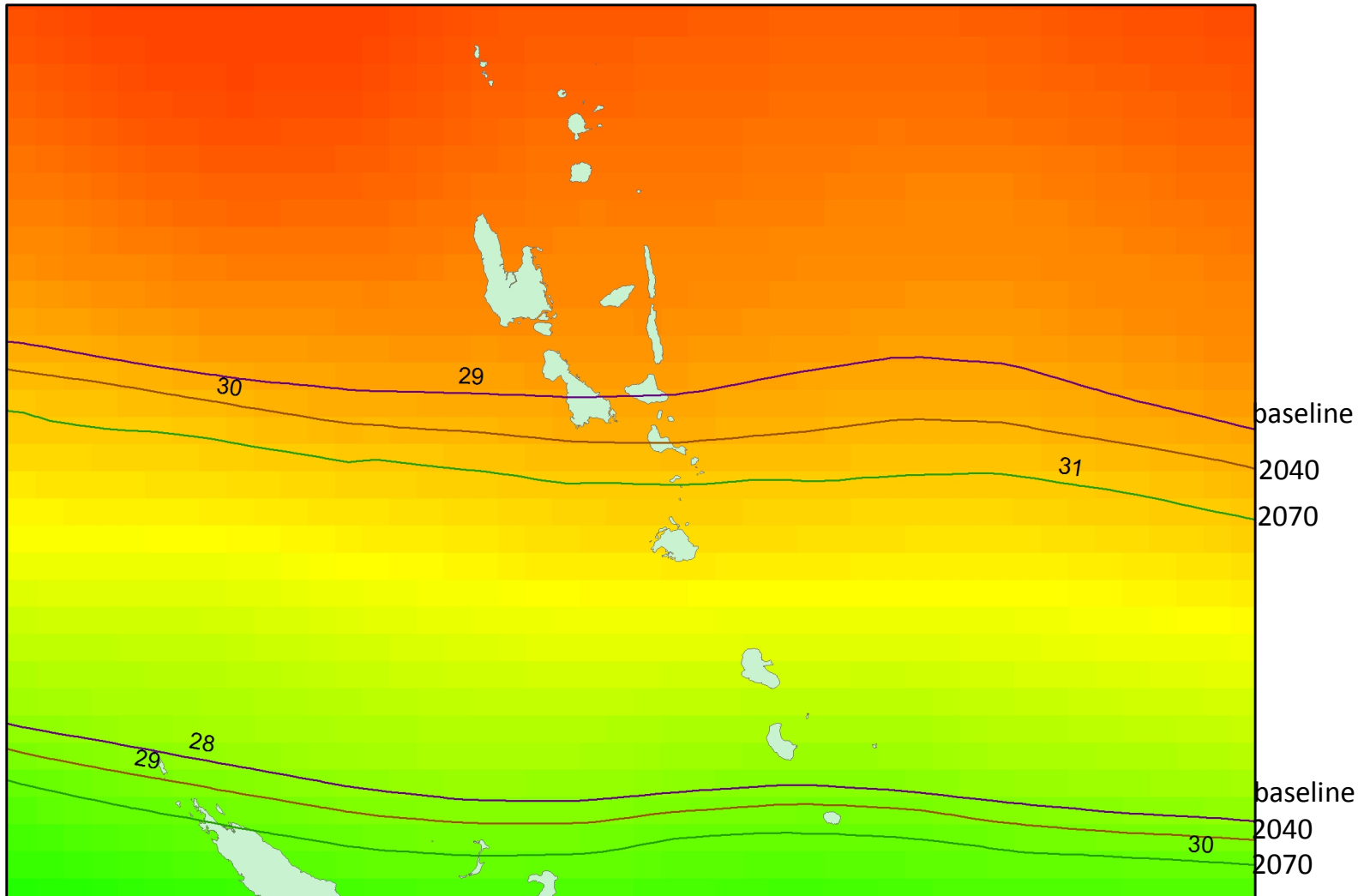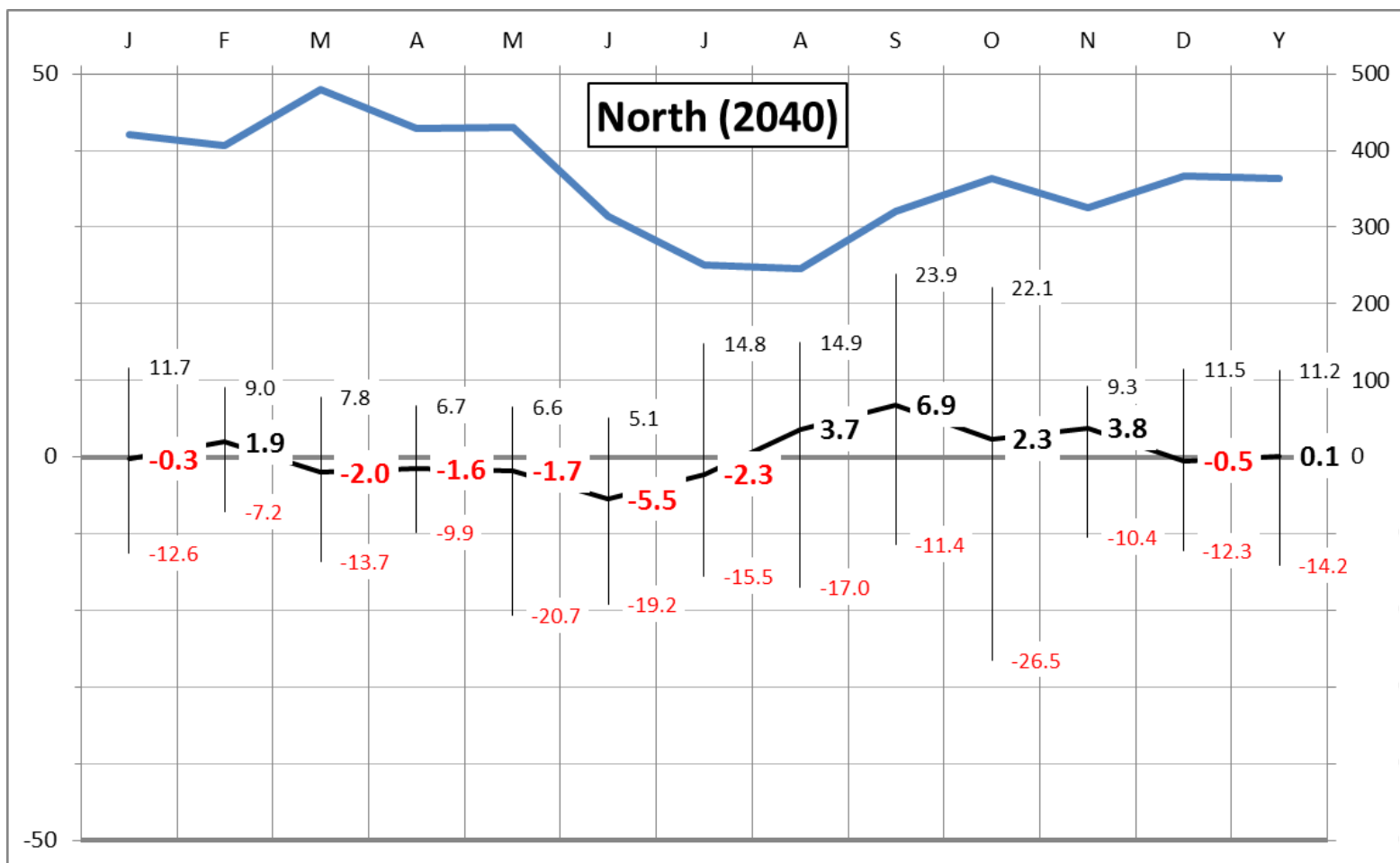
Annual precipitation

Annual precipitation varies considerably between the islands:

Precipitation change

To illustrate the variation of the projected percentage change in precipitation throughout the year, the following images show the monthly 25-percentile, median and 75-percentile change in precipitation by 2040 (%, left axis), as well as the monthly baseline precipitation (in mm, right axis) for North, Efate and South:

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The variation in the model results is much bigger than the differences between the islands. The significant variation in model-outputs for Efate is presented in the following graph, showing normalized values (%Δ-precipitation per °C of global warming) sorted for the different models:
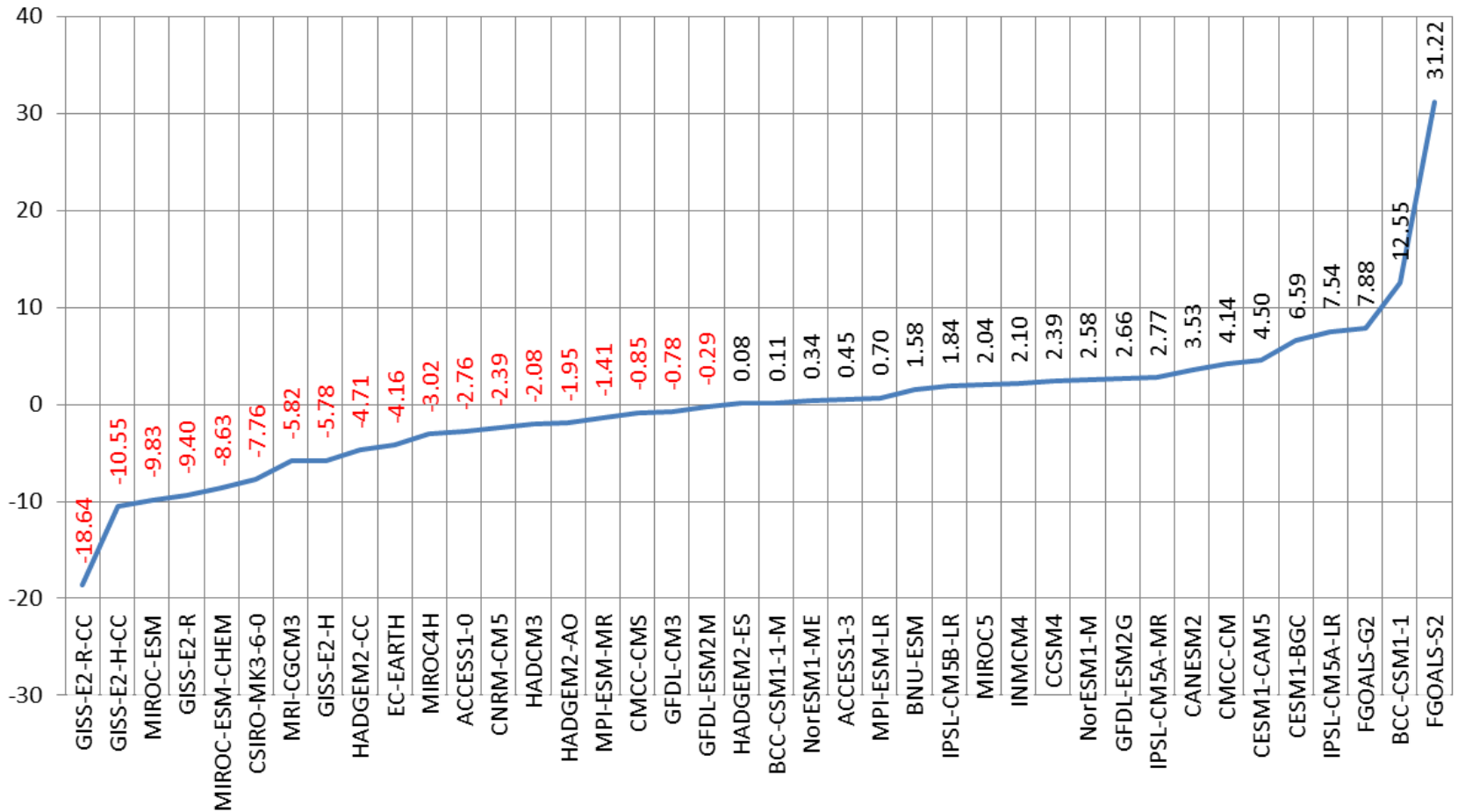
Extreme rainfall change

From an ensemble of 40 AR5 models, the median changes in extreme rainfall are presented below:

%change in extreme rainfall by 2040 (RCP8.5)
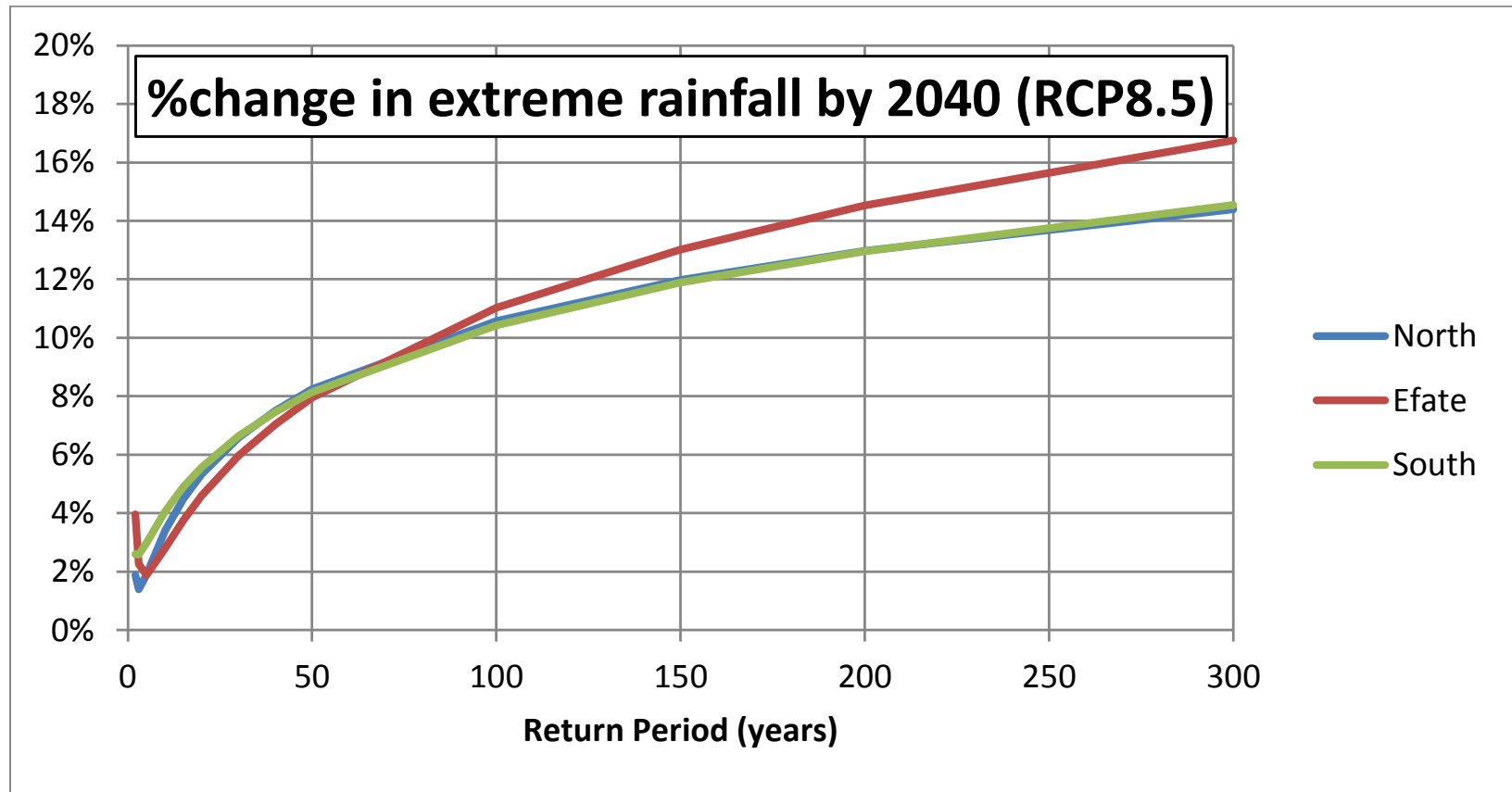
Extreme rainfall change

The following map shows the spatial distribution of the increase in the 1 in 20 year extreme, expressed as a percentage change per degree of global warming (from a 22-model ensemble):

Sea level rise

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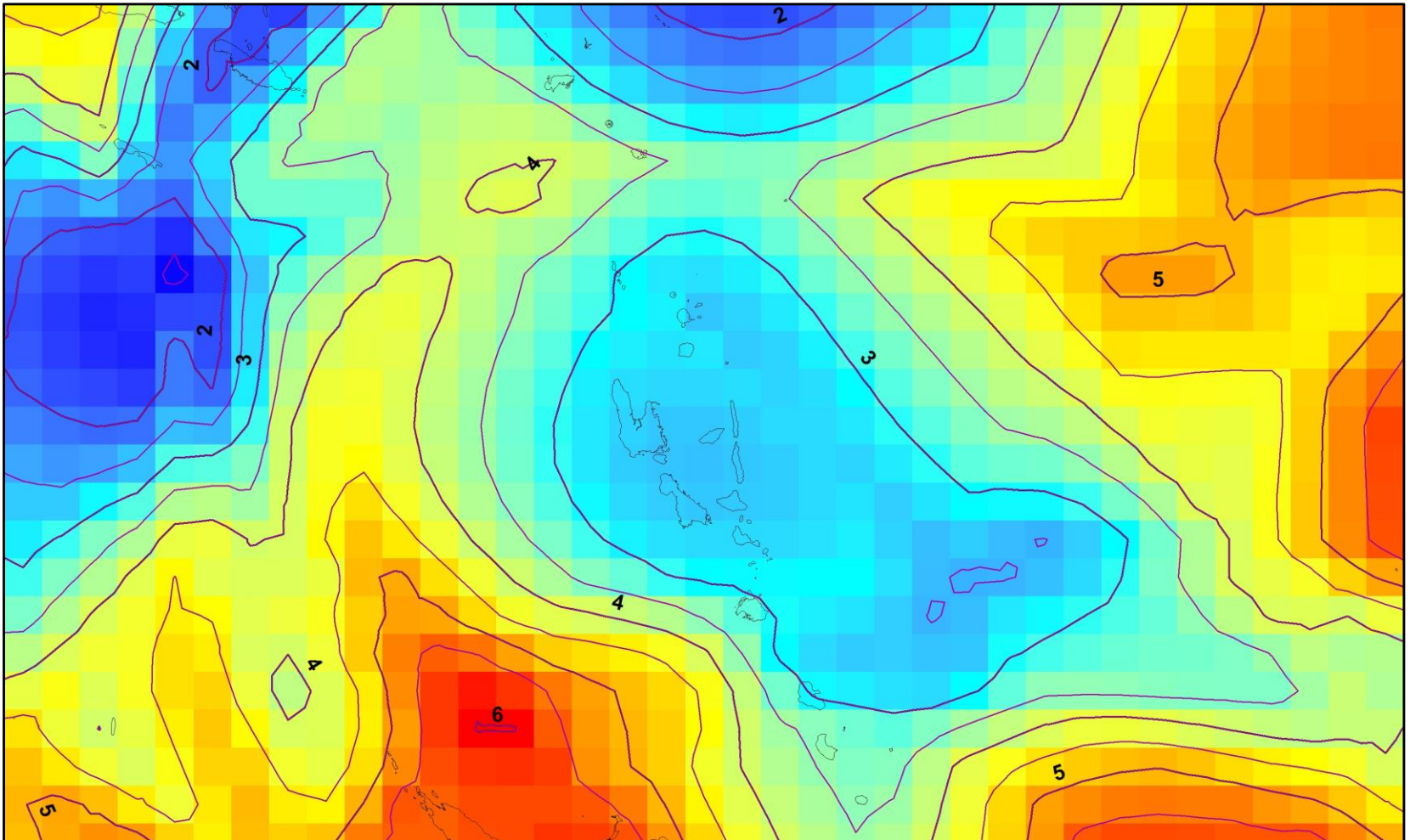
The increase in sea level is slow (current global average is 3.2 mm/year), but will continue for a long time, even when atmospheric CO_2-concentrations and temperature stabilize (with the current values, sea level will continue to rise for more than 500 years, with up to 5 meter rise for the global mean). Local vertical land movement (VLM) can either (partly) compensate for sea level rise (when land is rising), or aggravate the problem. As Vanuatu is a tectonically active area, significant vertical land movements are to be expected, which also might change over time. Continuous GPS estimates show -4.1 (±0.7) mm/year of vertical land movement at Port Vila (sinking).

SLR (in cm) at Port Vila for RCP8.5-high scenario (compared to 1995):

Year	global	local	with VLM
2040	23	26	48
2060	42	47	78
2080	66	74	115
2100	97	108	159

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- The projected change in precipitation from climate change is close to 0%, but carries a large uncertainty

- Coral reefs are double hit by ocean acidification and coral bleaching

- Local sea level rise is dramatically higher than previous projections

Thank you!

Questions?