SINGAPORE INTERNATIONAL ENERGY WEEK

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

A LOOK INTO SINGAPORE GEOTHERMAL POTENTIAL

26/10/2023

Lead PIs

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TUMCREATE

SURBANA JURONG

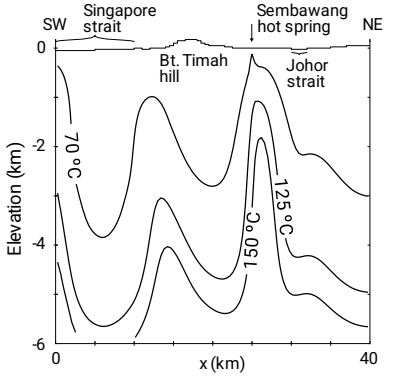
Intermittent geothermal research in Singapore

THE STRAITS TIMES
15th Aug 2009

Energy capacity to 'power 50,000 homes'

Geothermal study by NUS team, led by Prof Andrew Palmer

NUS National University of Singapore



2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023

Geothermal research stopped

Geothermal research stopped

First major study on Sembawang hot spring by Prof. Zhao Jian

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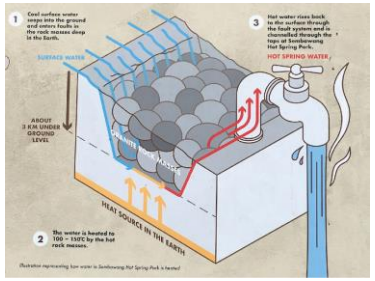

NRF research grant on Singapore geothermal potential, including temperature measurement to 1.5km deep

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Prolonged research hiatus for at least **14 out of 21 years**

Breaking the trend

Our ongoing research on the Singapore geothermal potential – first systematic investigation

Funding body

NATIONAL RESEARCH FOUNDATION
PRIME MINISTER'S OFFICE
SINGAPORE

Collaborative research

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Approach

Deep slimhole drilling;
Measure temperature;
Collect rock cores

Work Package 1 (WP1)

Use existing & upcoming data from WP1 to verify & constraint our computer model

Work Package 2 (WP2)

Potential heat utilisation cases based on results from WP1 and WP2

Work Package 3 (WP3)

Introduction

Our people

PRINCIPAL INVESTIGATORS

Alessandro Romagnoli

Prof. | NTU

Dr Tobias Massier

TUMCREATE

CO-INVESTIGATORS

Lim Jian Wei Mark

Research Asst. Prof. (Adj) | NTU

Zhao Zhiye

Assoc. Prof. | NTU

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RESEARCHERS

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NTU | WP1, WP2, WP3

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NTU | WP1, WP2

Mr Lu Dazhao

NTU | WP1

Mr Anurag Chidire

TUMCREATE | WP3

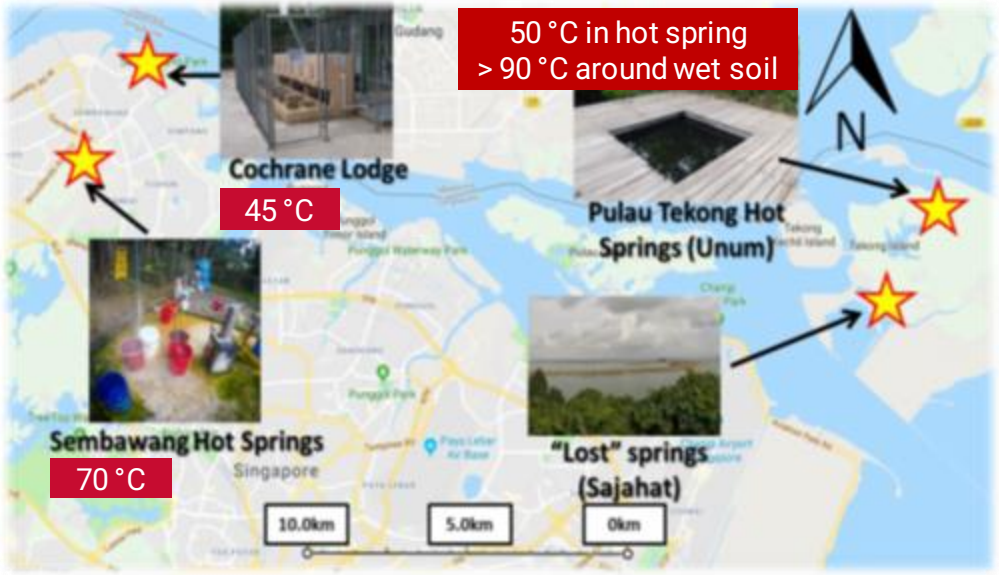
Mr Balaganesha B. V.

NTU | WP3

Key features indicating geothermal energy potential in Singapore

Hot springs

- At surface

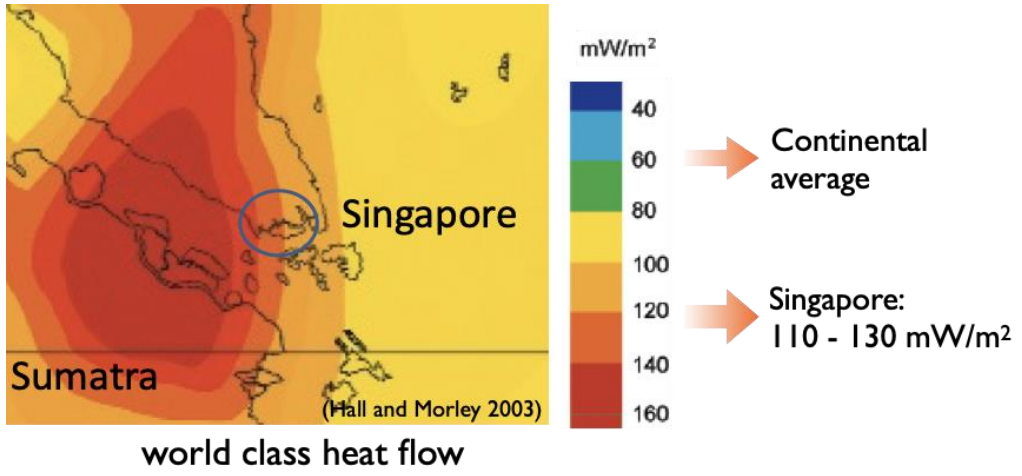


- At unknown depth

Na/K chemical geothermometer → 163°C

Heat flow

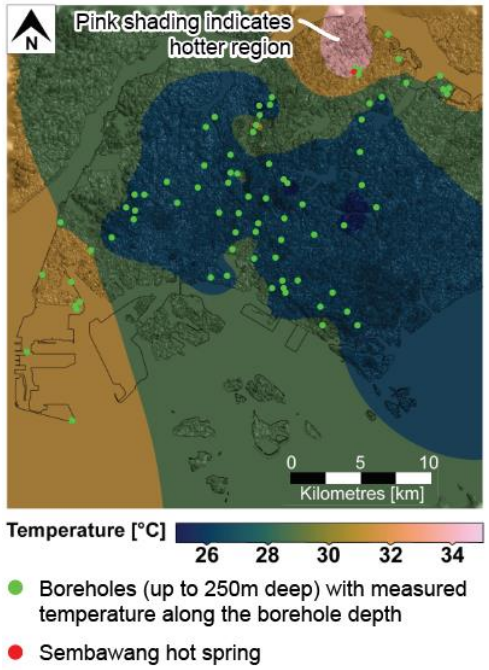
- Singapore's heat flow: 2 x continental average



world class heat flow

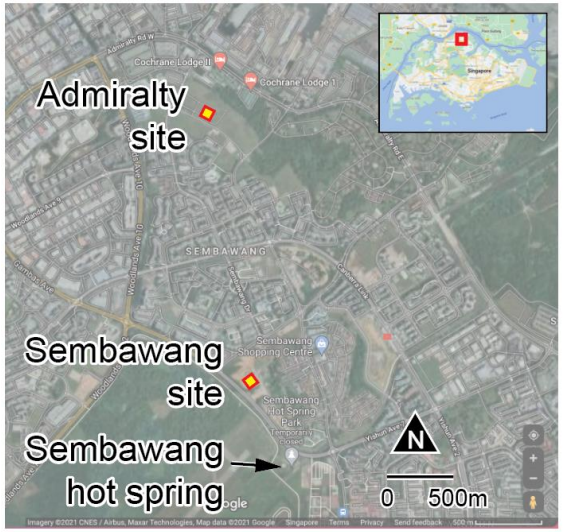
- Cornubian geothermal province (SW England): 105-130 mW/m²

Deep Drilling: site selection



Near-surface temperature

A hotter region in the north



Selected sites

Two slimhole drillings (1500m deep):
at Admiralty & Sembawang

Slimhole drilling

Collect 2-inch diameter rock core
Measure rock temperature

Other considerations

e.g. site availability, accessibility, proximity to hot spring, etc.

Deep Drilling: main activities

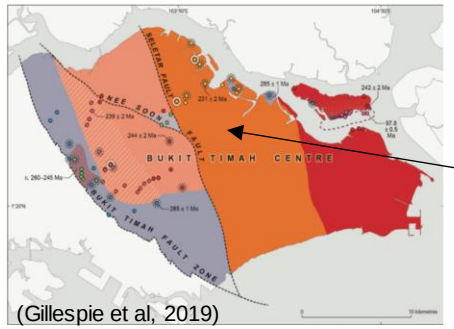
Admiralty site

Reached 1.1km depth in Q1 2023

BRUKER

X-Ray Fluorescence (XRF)

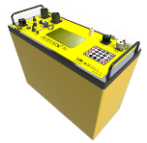
Measure radiogenic heat production, *A*, from rock cores



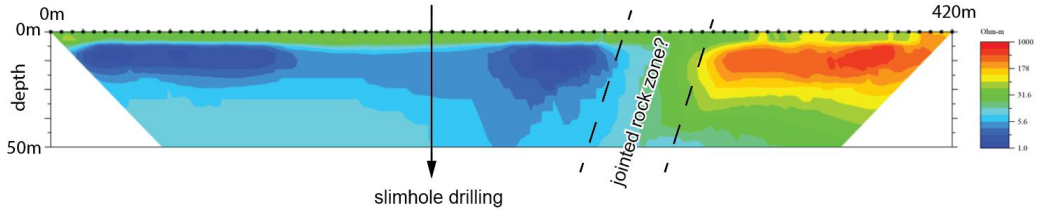
Simpang granite at 100-200m deep, $A \sim 7.8\ \mu W/m^3$

Soil resistivity survey

The driller can use the data to plan a drilling strategy



AGI Advanced Geosciences, Inc



Sembawang site

On-going: reach target depth by end of 2023

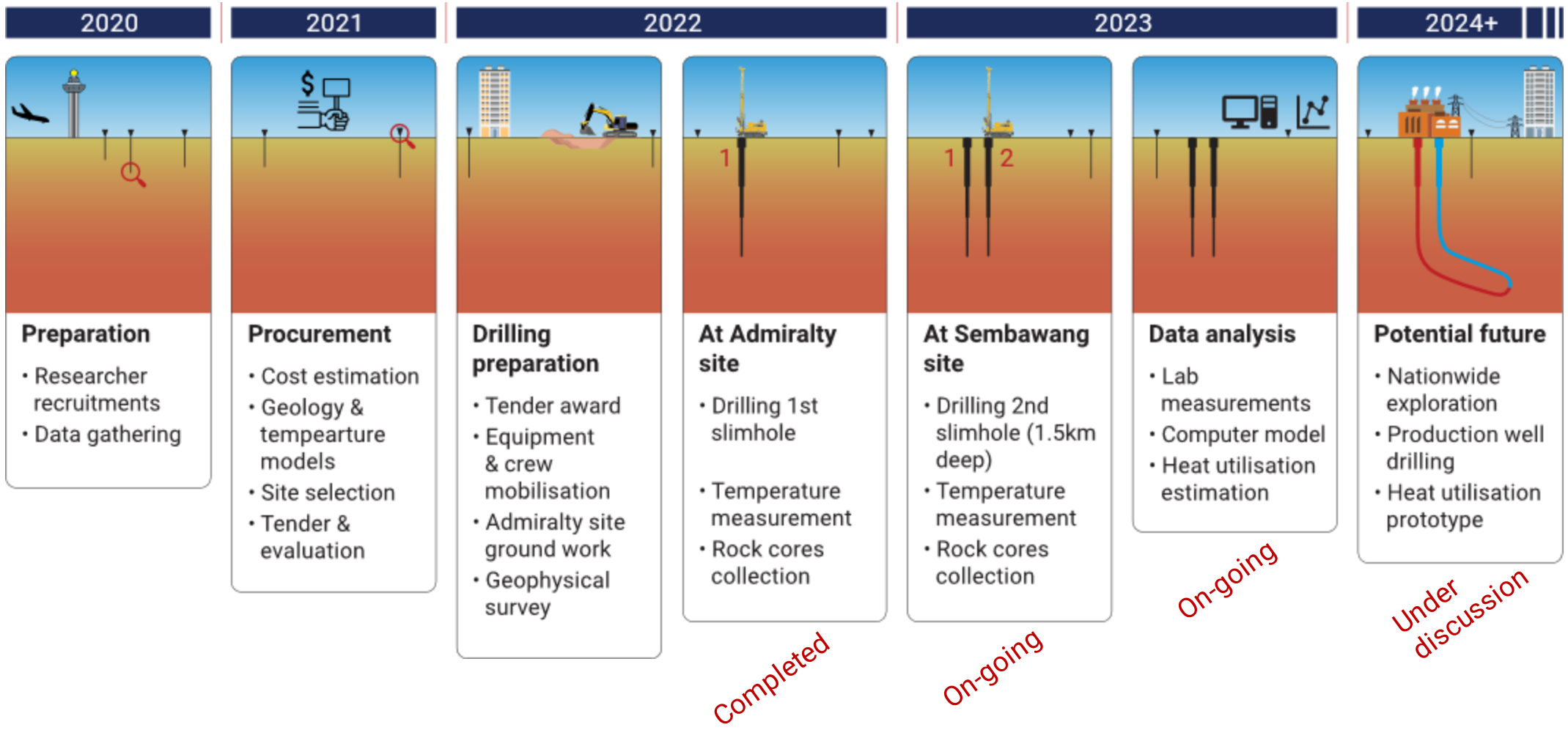
Other measurements

Rock core physical properties e.g. thermal conductivity

Data processing & analysis

Techno-economic evaluation of the best available utilization of Geothermal heat in Singapore

Project Development



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Thank you!

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