

Personal view on engineering as the director of Mizusawa

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Mizusawa VLBI Observatory of Japan



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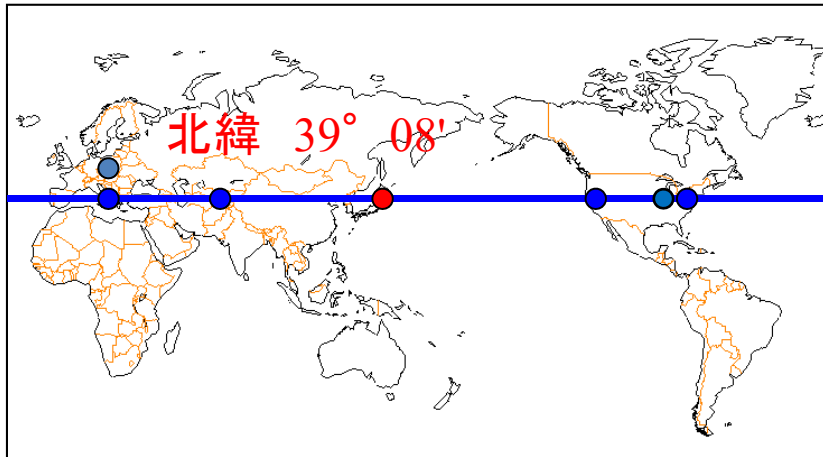
Introduction to Mizusawa's history

Established as one of International Latitude Observatories.



In 1988, re-organized as NAOJ.

“Z” everywhere in Mizusawa now (z-hall, z-alena, z-bus)



**First Director Kimura,
Discoverer of Z-term**



**Ohshu Space and
Astronomy Museum
(OSAM)**

20,000 visitors per year

Celebrating 120th anniversary in 2019

Current view of Mizusawa

電波望遠鏡



奥州宇宙遊学館

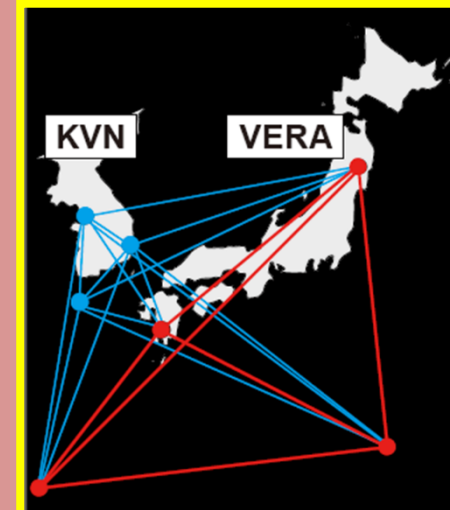
木村記念館



スパコン「アテルイ-II」

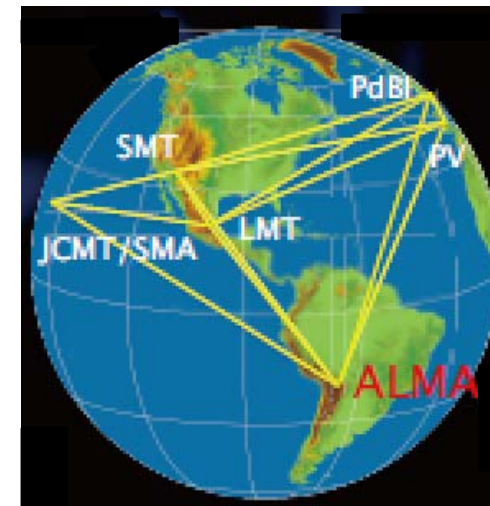
VLBI facility operated by Mizusawa

VERA
(2003~)



KaVA
(2014~)

EAVN
(2018~)



EHT
(2017~)

水沢VLBI観測所の装置

水沢ソフト関連器

日韓VLBI関連器 (KASI)



江刺地球潮汐施設



天文保時室 (水沢)



VERA 入来局



山口32m望遠鏡



VERA 水沢局, 10m



VERA 石垣島局



高萩・日立32m鏡



石垣島天文台

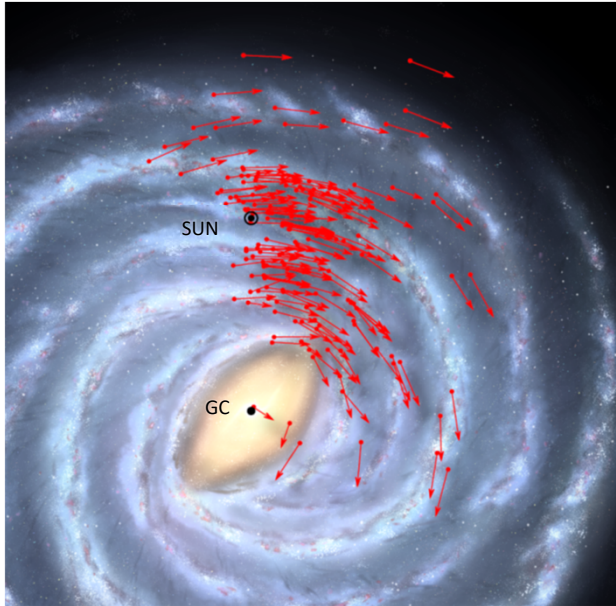


VERA 小笠原局

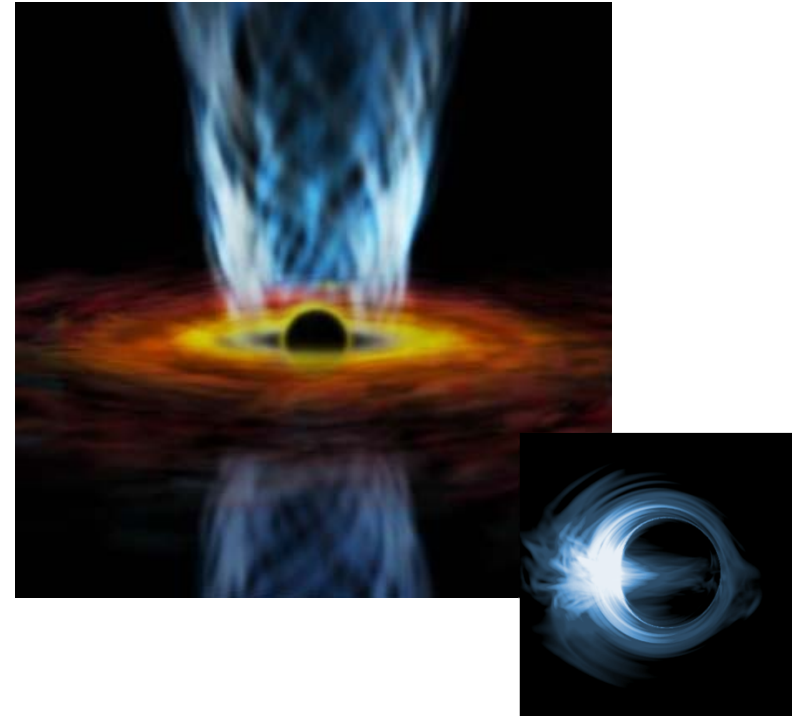


Introduction to VLBI Science

Milky Way Mapping



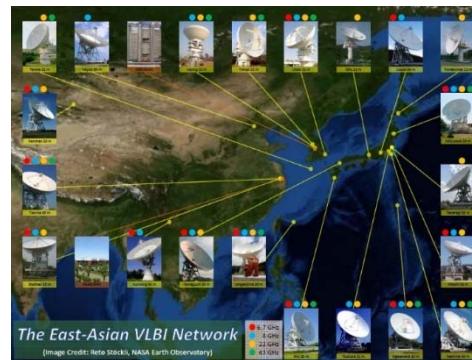
Black hole



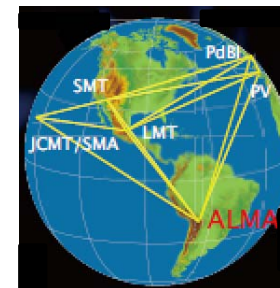
VERA



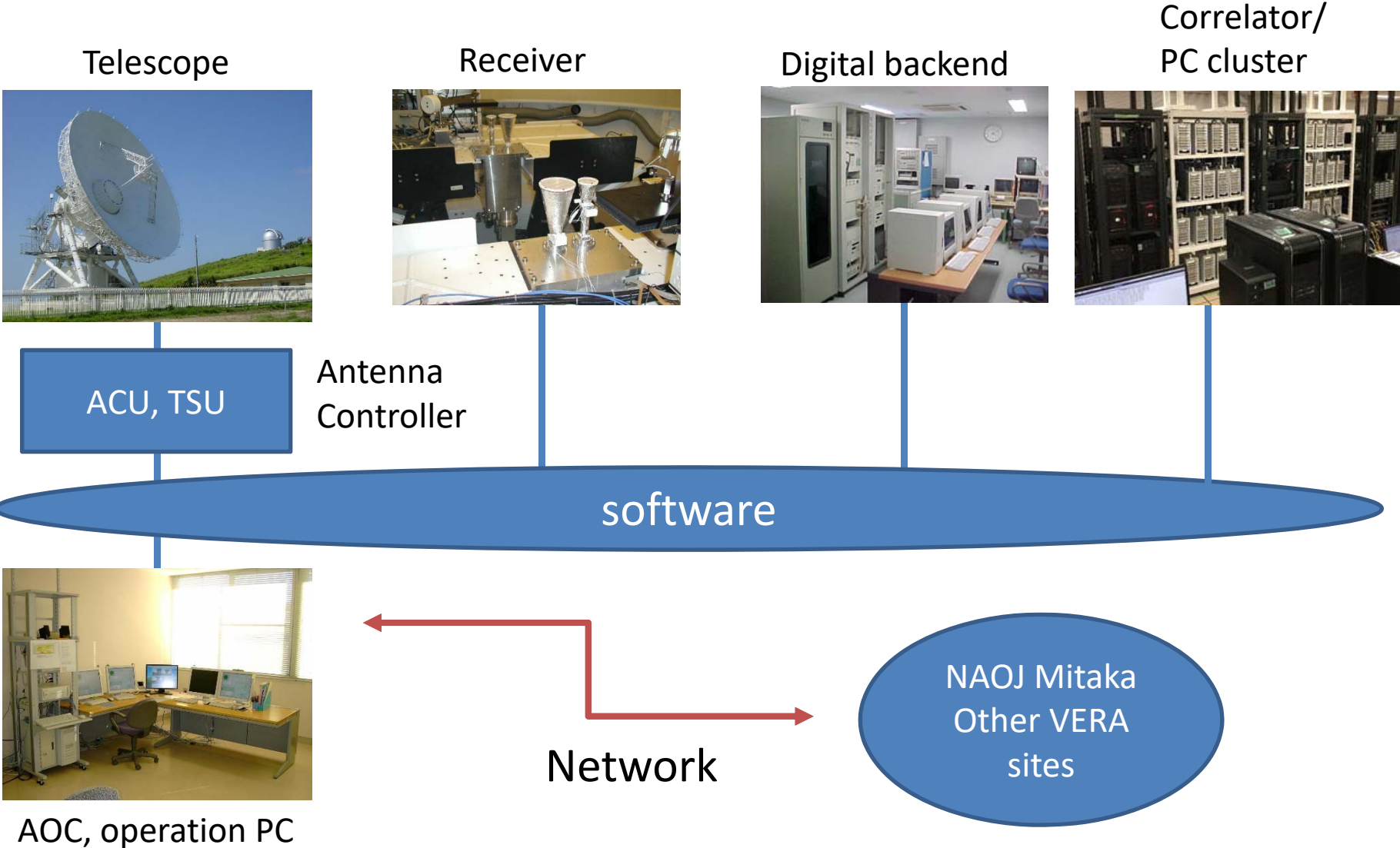
EAVN



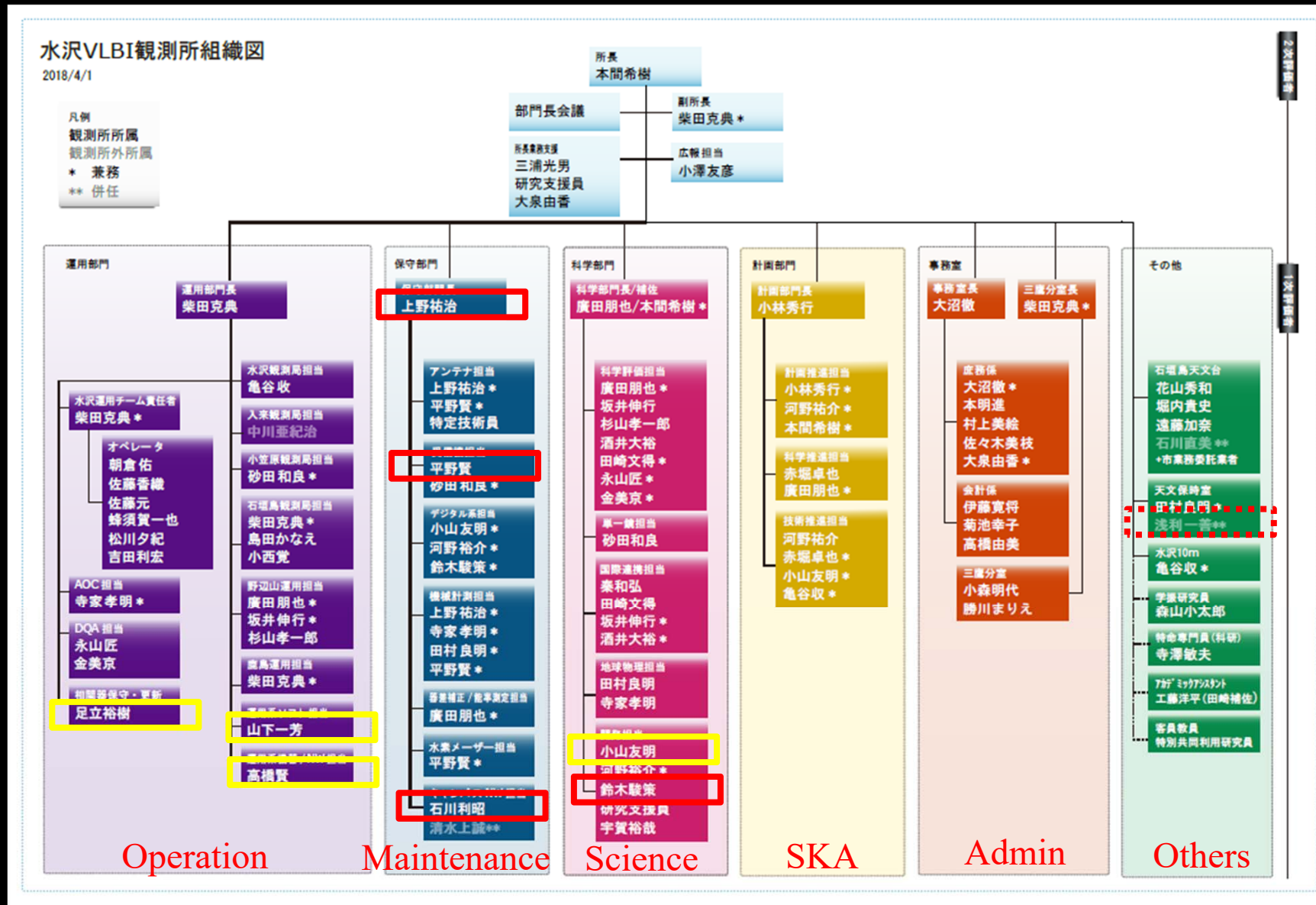
EHT



VERA system (x4)



Organization chart: 4 sections + Admin



Staff number: 52 (Permanent researcher: 10, Engineer: 4, Admin: 2, Contract: 36)

Role of Engineers in Mizusawa

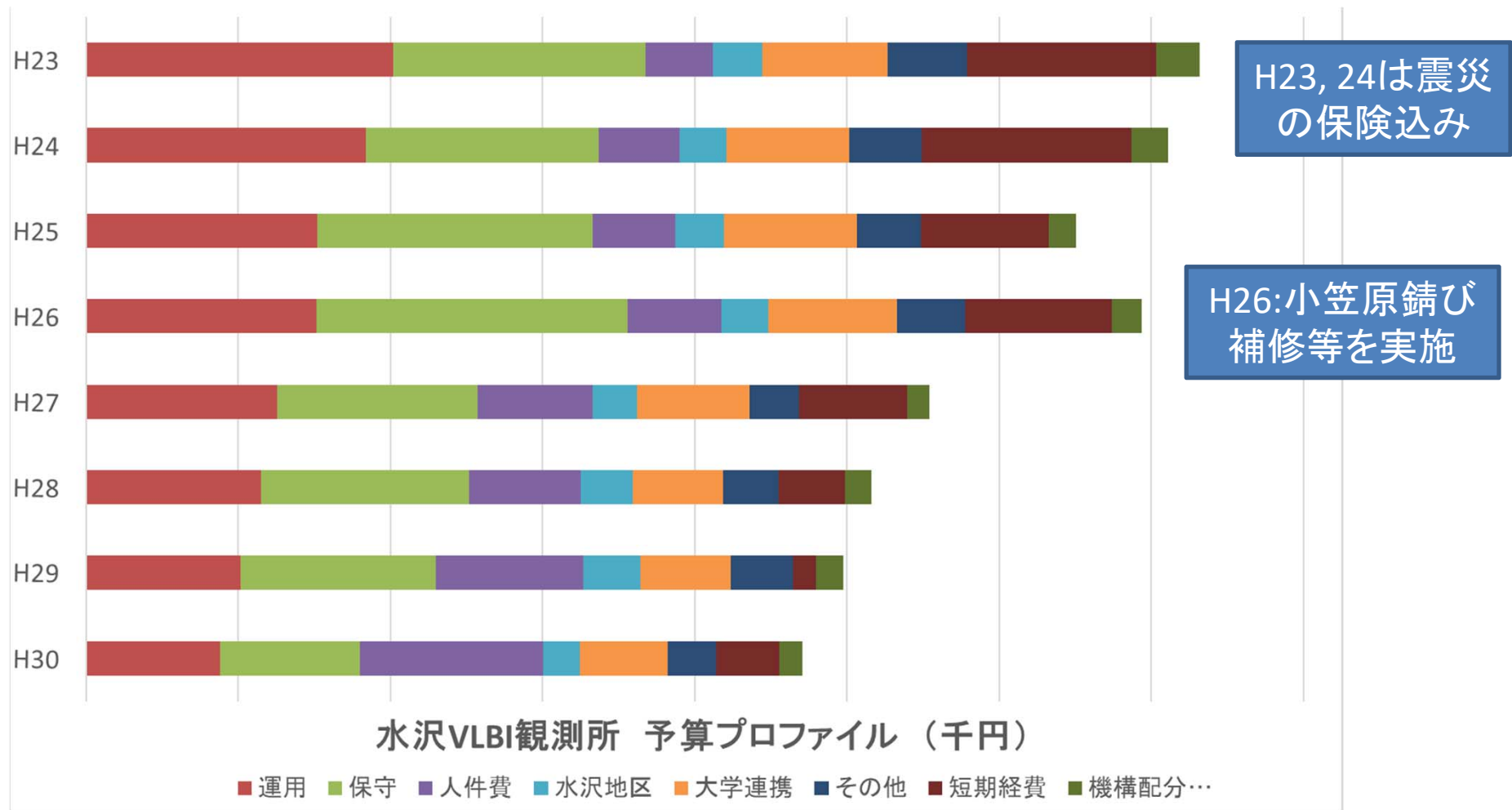
- 保守: Maintenance works at site
 - Telescope structure
 - Analog receiving system, masers
 - Digital backends
 - PCs/server machines and networks
- 開発: Development
 - Software/Hardware upgrades
- 運営: Management:
 - short-term/long-term maintenance plan
 - budget/FTE control etc.

These works are done by limited number of people in the project.

This often requires an “all-rounder” (especially for small project)

Comment: what is the appropriate fraction of all-rounder vs specialist for NAOJ?

Budget profile of Mizusawa



Cost reduction by ~1/3 for last 5 years

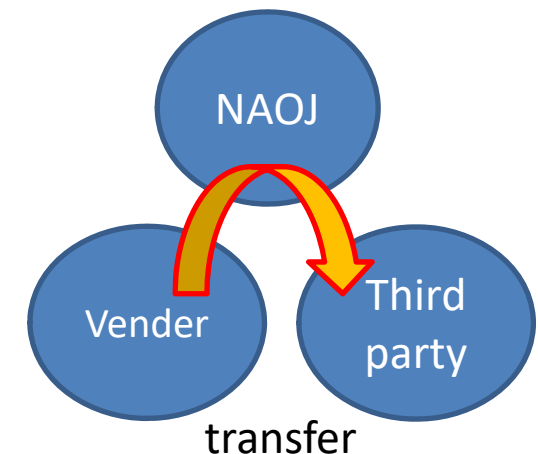
Ogasawara gearbox maintenance

- Maintenance
- Promote cost reduction through in-house maintenance.
 - Cases of FY2018
 - Rust repair of the gearboxes for elevation drive(Ogasawara)
 - Antenna drive current measurement
 - Antenna Lubricant and Grease change
 - Cases considered in-house maintenance after FY2019
 - Cryocooling system maintenance for Receiver
 - Compatible Antenna Time Synchronous Unit Release(developing now)
 - In FY2018, cost is reduced by about 40% compared with the period before FY2014.
(Comparison of three major items)



- Maintenance cost reduction effect by in-house

- Ex: Rust repair of the gearboxes for elevation drive(Ogasawara)
 - Supplier's cost : 72million Yen
 - In-house cost : 31million Yen
- 56% cost reduction

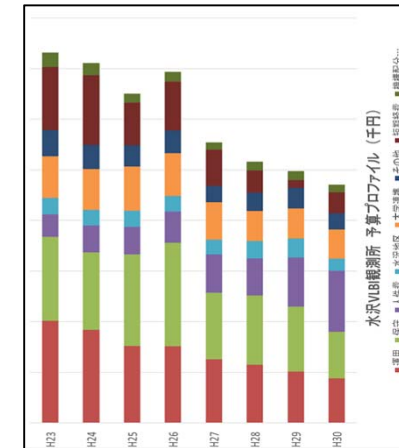


VERA Operation Status

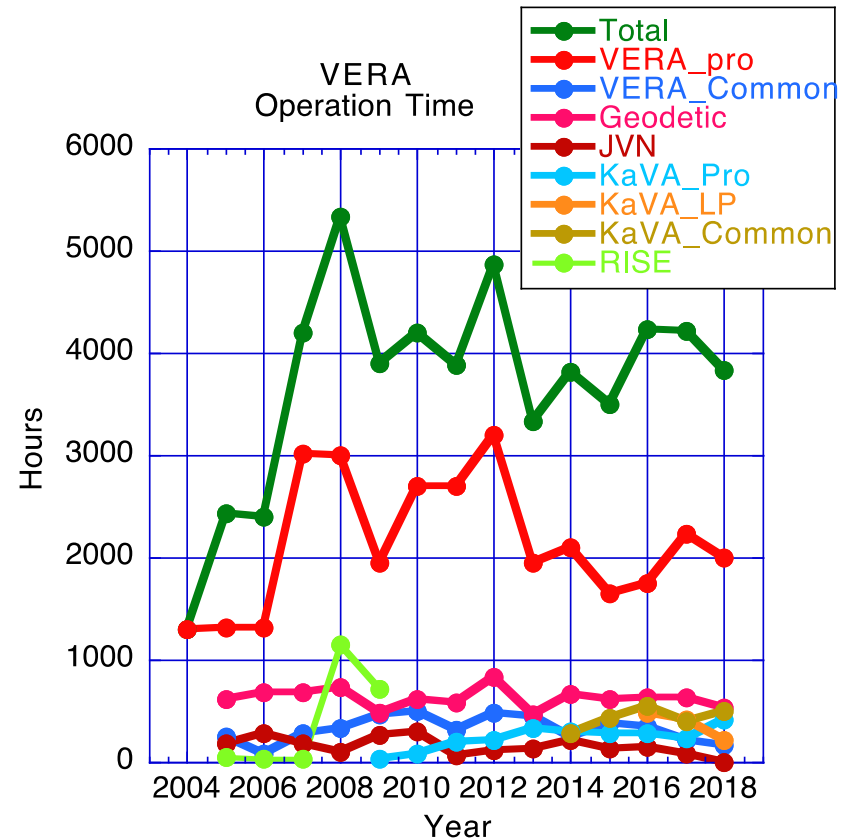
Sep 2017 – Aug 2018

- VLBI operation time
 - total ~ 3840 hr
 - VERA project
 - ~ 2000 hr
 - KaVA LP ~ 470 hr
 - Open use
 - VERA ~ 170 hr
 - KaVA ~ 500 hr
 - EAVN
 - ~ 160 hr

Budget

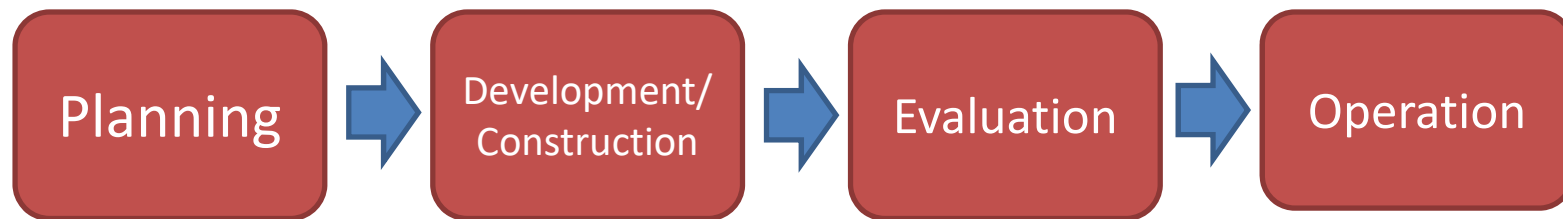


Operation hours



Some other issues (1): difference in project phase

- Project phase changes with a timescale of years



- Required skills may be different.
- Usually operation phase is longer than others (which could make it difficult to participate planning or development phases)
- Small, short-term project would be a good place for training.

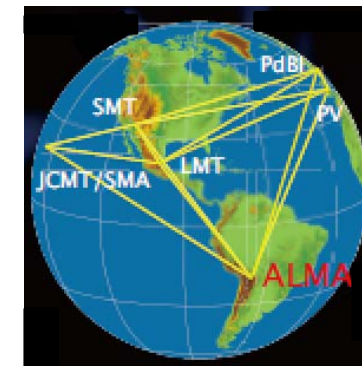
Other issues(2): Internationality

- VLBI (and all astronomy fields) is rapidly getting more international.
- Requires internationality including communication skill in English.
- It is not mandatory to be fluent, but should be able to tell your thought/opinion.
- Reading/writing is also needed.

EAVN



EHT



SKA



My expectation to 技術推進室

Better to establish a clear view on
NAOJ's demand on the types of engineers:
all-rounders vs specialist
who is which? how much fraction ?

By considering
the number and phases of projects, and
the career path of engineers

My view on mid-size project (like Mizusawa) for engineering

- Domestic mid-size project like Mizusawa is a good place to train young engineers. They can touch everything they like, and one can learn broad topics as an all-rounder.
- Since there are limitations of positions, career path is limited.
- Better to construct a pathway for engineers like being trained in mid-size project and then advance toward big projects.

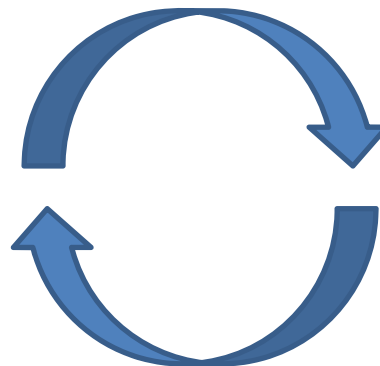
Mizusawa



Nobeyama



...



ALMA



Subaru



TMT