Discussion (II) - Science

Yusei Koyama (Subaru Telescope)

ULTIMATE-Subaru Science Team
Discussion Items

1. A/lps and (updated) timeline toward CoDR
2. Summarize requirements for ULTIMATE instruments
3. Identify weak points and missing science cases
4. How to establish network of our science team
5. Chair of Galactic team
6. Strong (and realistic) survey design for phase-I, II, III
7. Smaller issues (project website, science team wiki...?)

Anything else...?
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Anything else...?
Work schedule toward CoDR 2018

2017


4 Scientists: think about key science cases, new ideas (Phase-1)

5 early-mid May: deadline of the 1-page white paper

6 June: assign core person in each science case

7 early-Aug: Science core member meeting (#1)

8 late-Aug: start working separately by each science team

9 Science team: upgrading science cases (Phase-2)

10 early-Oct: Science core meeting (#2) for interim report/discussion

11 mid-Nov: Complete document from each science category

12 early-Dec: Science core meeting (#3) to balance the sections

2018

1 1/15,16 ULTIMATE “collaboration meeting 2018”

2 late-Jan: final version from each section

3 late Feb: Complete editorial work within ULTIMATE team, circulate within science team

4 Science team: Feedback phase (Phase-4)

5 late-Mar: Deadline for comments/feedback

6 mid-Apr: Final version ready

7 CoDR (May/June 2018)

We are Here!

(Need update)
### Updated work schedule (2018-2019)

<table>
<thead>
<tr>
<th>Date</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/15, 16</td>
<td>ULTIMATE “collaboration meeting 2018”</td>
</tr>
<tr>
<td>1/5, 16</td>
<td>New submission deadline from each team (2/16) !!</td>
</tr>
<tr>
<td></td>
<td>early March: Circulate the compiled draft of science sections within the team (3/10)</td>
</tr>
<tr>
<td>4/20</td>
<td>Final/fixed version from each team (4/20) !!</td>
</tr>
<tr>
<td>5/1</td>
<td>May: Complete editorial work within ULTIMATE WG</td>
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<tr>
<td>6/1</td>
<td>early June: Circulate the final version of the draft (6/1)</td>
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<tr>
<td>6/30</td>
<td>late June: Send the science document to reviewers (6/30?)</td>
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<tr>
<td>4/20</td>
<td>ULTIMATE GLAO CoDR (mid July) !!</td>
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<tr>
<td>4/20</td>
<td>Polish science requirement on instruments following the CoDR</td>
</tr>
<tr>
<td>10/15</td>
<td>1st announcement of ULTIMATE science WS (10/15?)</td>
</tr>
<tr>
<td>11/15</td>
<td>2nd announcement of ULTIMATE science WS, registration open (11/15?)</td>
</tr>
<tr>
<td>12/15</td>
<td>Deadline for registration for science WS (12/15?)</td>
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<tr>
<td>2</td>
<td>Feb 2019: Next ULTIMATE Science workshop ?</td>
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</tbody>
</table>

TBD
Science document to be prepared by CoDR (July 2018)

1. Executive Summary

2. Science cases
   i. High-z imaging
   ii. High-z MOS
   iii. IFU
   iv. Nearby Galaxies
   v. Galactic Science

3. Science requirement for instruments
   i. Imaging: sensitivity, FoV, pixel scale, filter set, tunable filter
   ii. Spec: Wavelength coverage, resolution, multiplicity (spec)
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Anything else...?
• Strongest point of ULTIMATE
• Weak points
• Missing science cases
• Complementarity with space missions

• Instrument plan
  – Imager: JWST, WFIRST, GLAO+HAWK-I
    • Tunable filter?
  – MOS: MOSFIRE
  – Multi-IFU: SINFONI, KMOS, GIRMOS…
    • Very sensitive multi-IFU?
ULTIMATE-Subaru key science (mostly with high-z imaging)

“Birth, Life, Death” of galaxies in the cradle of large-scale structure

1. First galaxies (birth)
   - Unprecedentedly deep NB imaging to detect galaxies a “cosmic dawn” (z>>7).
   - Go beyond the depths of JWST.
   - Extension of HSC optical NB survey

2. Stellar build-up (life)
   - Origin of Hubble sequence: bulge, disk, and black hole growth
   - Deep & sharp & panoramic NB imaging and 3-D spectroscopy of galaxies at “cosmic noon” (z=0.5-3.5)

3. Quenching (death)
   - Tracking down the “passive” galaxies to z~5 with deep BB/MB imaging (in K-band).
   - Environment of dead galaxies: do first galaxies die in isolation or in clusters?
   - Great synergy with WFIRST.
Advantage/complementarity with other space/ground-based facilities

- **JWST (NIRCAM):**
  - Only 3 NB filters at 1.6<l<2.2um (no NB at l<1.6um)
  - No medium-band filters.
  - ULTIMATE has ~20 times wider FoV.

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<th>Saturation</th>
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<td>K ~ 9.0 Vega</td>
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<td>K ~ 9.6 Vega</td>
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<td>9.1 nJy</td>
<td>K ~ 9.3 Vega</td>
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<tr>
<td>F210M</td>
<td>14.9 nJy</td>
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<tr>
<td>F212N</td>
<td>129 nJy</td>
<td>K ~ 5.6 Vega</td>
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<tr>
<td>F277W</td>
<td>14.3 nJy</td>
<td>K ~ 9.6 Vega</td>
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<td>K ~ 10.0 Vega</td>
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<tr>
<td>F444W</td>
<td>23.6 nJy</td>
<td>K ~ 8.0 Vega</td>
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7. Smaller issues (project website, science team wiki...?)

Anything else...?
Science team organization toward CoDR2018

Project scientist (editor chair, Koyama)

High-z Imaging (Kodama)
- Hayashi
- Iwata
- Kikuta
- Kohno
- Koyama
- Y.T. Lin
- Matsuda
- Minowa
- *Onodera
- *Shibuya
- Shimakawa
- T. Suzuki
- *I. Tanaka

High-z MOS (Tadaki)
- Akiyama
- Hayashi
- Matsuoka
- Nagao
- Nakajima
- Onodera
- Shibuya
- Masayuki Tanaka
- Toba
- Yabe

IFU spectroscopy (Lidman)
- Bian
- Bryant
- Bloom
- Casey
- Croom
- Leslie
- Nataf
- Kewley
- I.T. Ho
- Shaefer
- Shimakawa
- Yuan

Nearby galaxies (Motohara)
- Iono
- Kaneko
- J, H, Kim
- Koda
- *Koyama
- Saito
- Sorai
- Takeuchi
- Masaomi Tanaka
- I. Tanaka
- J. Ueda
- Yamashita

Galactic / Local Group (Koyama)
- Chiba
- Fukui
- Guyon
- Koshimoto
- C. H. Lee
- Matsunaga
- Nishiyama
- Oasa
- Pyo
- Sumi
- D. Suzuki
- Terai
- Torii
- Yasui
• “Interface” scientist in each partner?
  - Japan: Y. Koyma
  - Taiwan: Y.T. Lin
  - Australia: C. Lidman
  - Canada: any good candidate?

• Some regular telecon for science core members (i.e. chief of each science section + representative of each partner)?

• Broader support from the community

• Workshop / next meeting in ~1-year time scale?
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Anything else...?
K-band deep/wide survey

- HAWK-I / VLT + GLAO?
- JWST?
- Other BBs, NB/MB?
- H+K MOS / J,H,K IFU?
Survey design (SSP with WFC+GLAO)

Need to consider realistic situation…

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- U-Deep (~30%?)
- Deep (~30%?)
- MOS? Nearby galaxies? (~30%?)
- Galactic (Openuse?)
### Timeline of (large) programs?

<table>
<thead>
<tr>
<th>Year</th>
<th>High-z imaging</th>
<th>High-z MOS</th>
<th>IFU</th>
<th>Nearby</th>
<th>Galactic</th>
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<tbody>
<tr>
<td>2025</td>
<td>Precursor study with MOIRCS openuse</td>
<td>GLAO + MOIRCS Intensive?</td>
<td>SSP with WFI?</td>
<td>Precursor study with MOIRCS openuse</td>
<td>Openuse (or organize Galactic intensive?)</td>
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<td>2026</td>
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<td>2031</td>
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- **GLAO 1st light**: GLAO + MOIRCS Intensive?
- **WFIRST launch**: WFI?
- **M-IFS?**
- **PFS SSP**
- **WFIRST launch**
- **SSP with WFI?**
- **M-IFS intensive?**
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