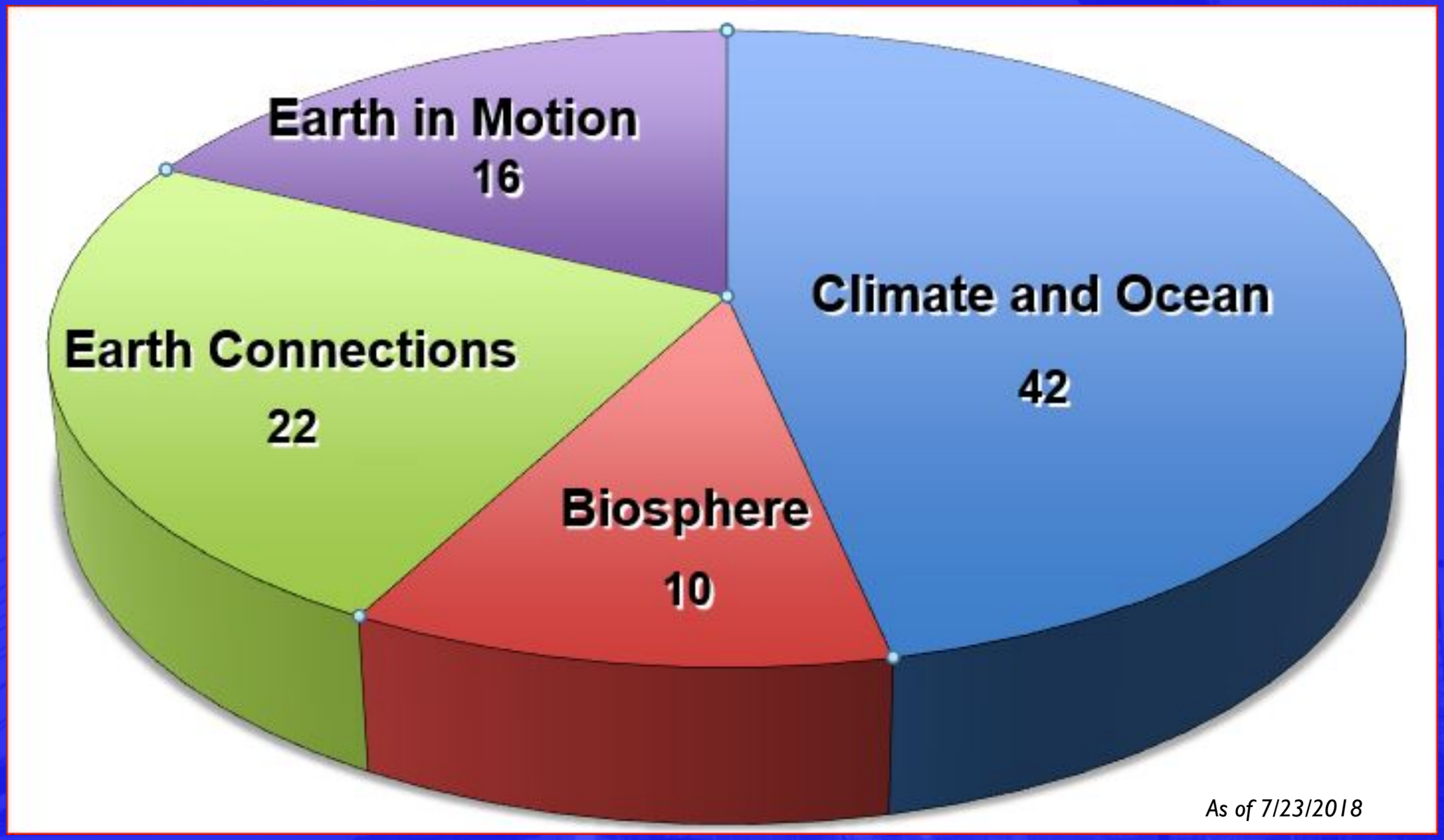
International Ocean Discovery Program:

Progress Toward Science Plan Fulfillment

Prepared for the 2018 IODP Forum
Goa, India
James A. Austin, Jr., Forum Chair

(with substantial input from the IODP Science Support Office)

Active proposals (90) by Science Plan Theme



Key for the following slides:

Top US priority challenge for JR IODP operations (as of 2012)

JOIDES Resolution

Mission-Specific Platform (MSP)

Chikyu (*** = PCT approved)

Note: updated after March-June 2018 EFB/CIB/JRFB/SEP decisions.

Climate and Ocean Change

Science Plan Challenge	Completed/**Scheduled** Expeditions (#) = submitted proposal(s)
1. Climate response to high atmospheric CO_2	361 SAFARI 369 SW Aust. K climate and tectonics 371 Tasman Frontier subduction **378** S. Pac. Paleogene (567) **382** Iceberg Alley Paleoceanography (902/846-APL) **383** Dynamics of the Pacific Antarctic Circumpolar Current (912) **387** Amazon Margin (859) **388** Equatorial Atlantic Gateway (864) **390/393** South Atlantic Transect (853) **392** Agulhas Plateau (834) **389** Hawaiian Drowned Reefs (716)
2. Ice sheet and sea level response to warming climate	(347 Baltic Sea) **389** Hawaiian Drowned Reefs (716) **373** Central Antarctic Paleoceanography (813) 359 Maldives Monsoon 374 Ross Sea WAIS **379** Amundsen Sea WAIS (839) **382** Iceberg Alley Paleoceanography (902/846-APL) **383** Dynamics of the Pacific Antarctic Circumpolar Current (912) **388** Equatorial Atlantic Gateway (864) **390/393** South Atlantic Transect (853)

Climate and Ocean Change

Science Plan Challenge	Completed/**Scheduled** Expeditions
3. Control of regional precipitation patterns	(341 S. Alaska Margin) (346 Asian Monsoon) 353 Indian Monsoon 354 Bengal Fan 355 Arabian Sea 356 Indonesian Throughflow *359* Maldives Monsoon 361 SAFARI *363* W. Pacific Warm Pool **387** Amazon Margin (859) **388** Equatorial Atlantic Gateway (864) **389** Hawaiian Drowned Reefs (716)
4. Ocean response to chemical perturbation	364 Chicxulub Impact 369 SW Aust. K climate and tectonics 374 Ross Sea WAIS **378** South Pacific Paleogene Climate (567) **388** Equatorial Atlantic Gateway (864) **390/393** South Atlantic Transect (853) **392** Agulhas Plateau (834)

Biosphere Frontiers

Science Plan Challenge	Completed/**Scheduled** Expeditions
5. Origin, composition, and global significance of sub-seafloor biosphere	(347 Baltic Sea) 357 Atlantis Massif **389** Hawaiian Drowned Reefs (716) 366 Mariana Convergent Margin **385** Guaymas Basin (833) **390/393** South Atlantic Transect (853)
6. Limits of sub-seafloor life	**370** Temperature Limit of the Deep Biosphere off Muroto **389** Hawaiian Drowned Reefs (716) 374 Ross Sea WAIS 376 Brothers Arc Flux **390/393** South Atlanic Transect (853)
7. Ecosystem sensitivity to environmental change	364 Chicxulub Impact **389** Hawaiian Drowned Reefs (716) **387** Amazon Margin (859) **388** Equatorial Atlantic Gateway (864) **390/393** South Atlantic Transect (853)

Earth Connections

Science Plan Challenge	Completed/**Scheduled** Expeditions
8. Upper mantle composition/structure/ dynamics	357 Atlantis Massif (345 Hess Deep) 356 Indonesian Throughflow 360 SW Indian Ridge Lower Crust/Moho **391** Walvis Ridge Hotspot (890) **392** Agulhas Plateau (834)
9. Seafloor spreading and ocean crustal architecture	381 Corinth Rift (345 Hess Deep) 349 South China Sea Tectonics 367/368 South China Sea Rifted Margin 369 SW Australia K Climate & Tectonics **384** Panama Basin Crustal Architecture (769-APL2) + Eng. Testing **388** Equatorial Atlantic Gateway (864) **391** Walvis Ridge Hotspot (890) **392** Agulhas Plateau (834)
10. Chemical exchange between oceanic crust and seawater	357 Atlantis Massif 376 Brothers Arc Flux **388** Equatorial Atlantic Gateway (864) **390/393** South Atlantic Transect (853) **392** Agulhas Plateau (834)
11. Subduction, volatile cycling, and formation of continental crust	350 Izu Bonin Mariana: Rear Arc 351 Izu Bonin Mariana: Arc Origins 352 Izu Bonin Mariana: Forearc 371 Tasman Frontier Subduction

Earth in Motion

Science Plan Challenge	Completed/**Scheduled** Expeditions
12. Control of earthquakes, landslides, tsunami	365 NanTroSEIZE Megasplay LTBMS (NanTroSEIZE 1,2,3) **358** Nankai Riser Drilling, C0002 (334/344 CRISP A) 362 Sumatra Seismogenic Zone 372 Hikurangi LWD 375 Hikurangi Observatory
13. Storage/flow of sub-seafloor carbon	372 Hikurangi LWD 375 Hikurangi Obervatory **385** Guaymas Basin (833)
14. Fluids linking sub-seafloor tectonic, thermal and biogeochemical processes	357 Atlantis Massif 366 Mariana Convergent Margin 376 Brothers Arc Flux **385** Guaymas Basin (833)

Full Proposals by Theme/Challenge

- Updated after March-June 2018 CIB/FB/SEP decisions
- Does not include pre-proposals (except as noted)

Key:
* = Holding Bin, after external review
** = undergoing external review (following June 2018 SEP)
( ) = done during Integrated Ocean Drilling Program
{ } = security issues

Top U.S. priority challenge for JR, as of 2012
JOIDES Resolution
Mission-Specific Platform
Chikyu (*** = PCT approved)

Climate and Ocean Change

Challenge	At CIB/FBs	At SEP
1. Climate response to high atmospheric CO_2	771 Iberian Margin Paleoclimate {778 Tanzania Margin Paleoclimate Transect} 874 Neogene Newfoundland Sed. Drifts 708 ACEX2 730 Sabine Bank 871-CPP Lord Howe Rise***	747 N. Atl. Paleogene Climate 814 Greenland Ice Sheet 848 Weddell Sea History 888 Aleutian Basin Formation 895 Med.- Atl. Gateway 909 NW Greenland 911 Argentine Margin Paleo. 934 Arctic-Atlantic Gateway
2. Ice sheet and sea level response to warming climate	730 Sabine Bank Sea Level 732 Antarctic Peninsula Sediment Drifts 771 Iberian Margin Paleoclimate 777-APL3 Okinawa	814 Greenland Ice Sheet 848 Weddell Sea History 863 MDP - Integrated Southern Ocean Latitudinal Transects 895 Med.- Atlantic Gateway 909 NW Greenland 911 Argentine Margin Paleo Transects 934 Arctic-Atlantic Gateway

Climate and Ocean Change

Challenge	At CIB/FBs	At SEP
3. Control of regional precipitation patterns	{549 Arabian Sea Monsoon} {595 Indus Fan/Murray Ridge} 618 East Asian Margin	819-APL2 Arabian Sea OMZ* 895 Med.- Atlantic Gateway
4. Ocean response to chemical perturbation		819-APL 2Arabian Sea OMZ* 888 Aleutian Basin Formation 895 Med.- Atlantic Gateway

Biosphere Frontiers

Challenge	At CIB/FBs	At SEP
5. Origin, composition, and global significance of sub-seafloor biosphere	633 Costa Rica Mud Mounds 830-APL Scott Plateau	910 Cont. Margin Methane – Rio Grande 911 Argentine Margin Paleo. 929 Blake Nose Sub-seafloor Life
6. Limits of sub-seafloor life	921-APL Hole 896A Biosphere	929 Blake Nose Sub-seafloor Life
7. Ecosystem sensitivity to environmental change	{724 Gulf of Aden}	819-APL2 Arabian Sea OMZ* 911 Argentine Margin Paleo. 929 Blake Nose Sub-Seafloor Life

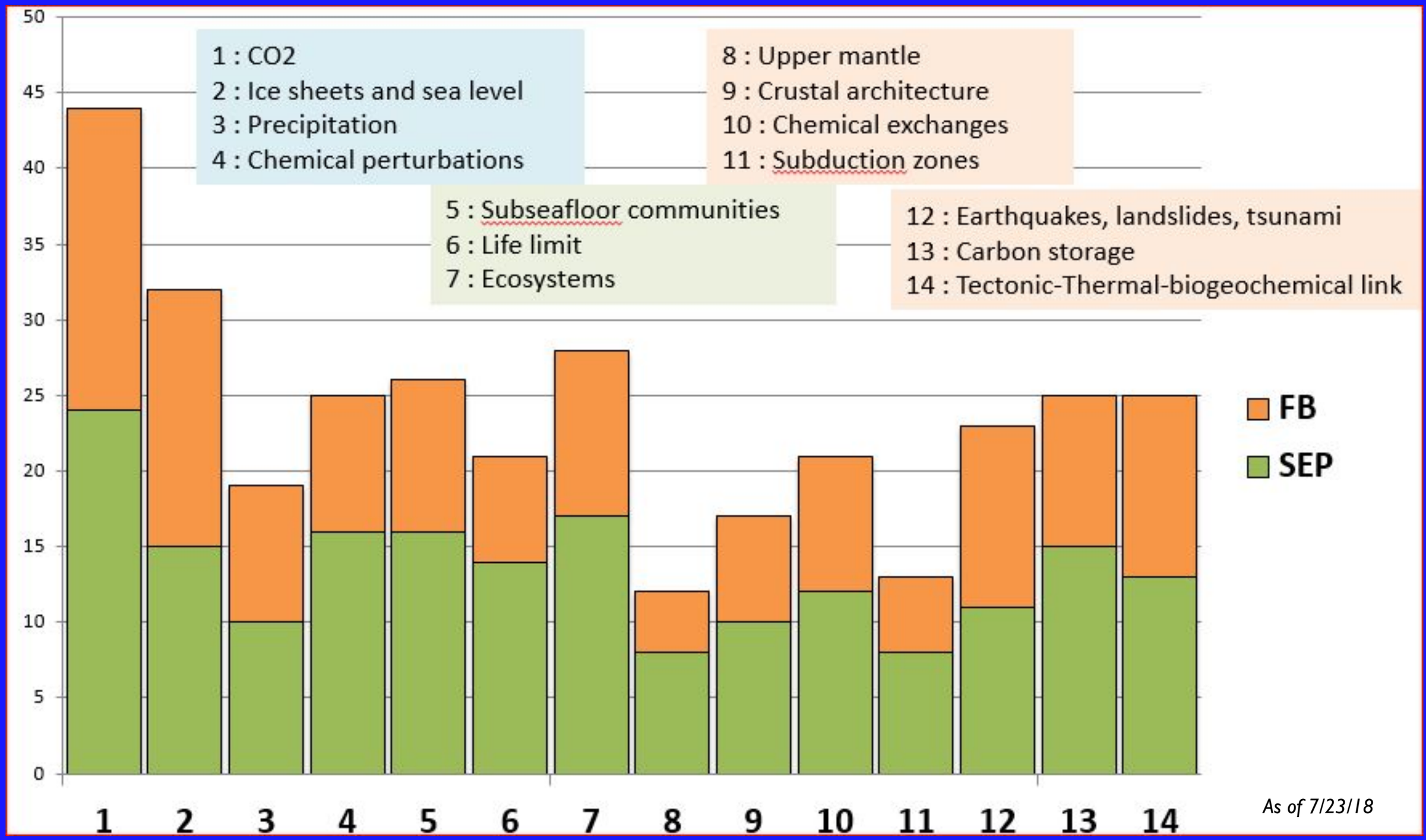
Earth Connections

Challenge	At CIB/FBs	At SEP
8. Upper mantle composition/ structure/dynamics	522 Superfast Spreading Crust 892 Reykjanes Mantle Convection	805 MDP - Mohole to the Mantle 939 Tohoku Petit-Spot Magmatism
9. Seafloor spreading and ocean crustal architecture	522 Superfast Spreading Crust 871-CPP2 Lord Howe Rise***	805 MDP - Mohole to the Mantle
10. Chemical exchange between oceanic crust and seawater	892 Reykjanes Mantle Convection 921-APL Hole 896A Biosphere	939 Tohoku Petit-Spot Magmatism
11. Subduction, volatile cycling, and formation of continental crust	698 IBM Middle Crust*** 781B Hikurangi Riser 908-APL Costa Rica Megathrust Fluid Pressure	888 Aleutian Basin Formation 939 Tohoku Petit-Spot Magmatism

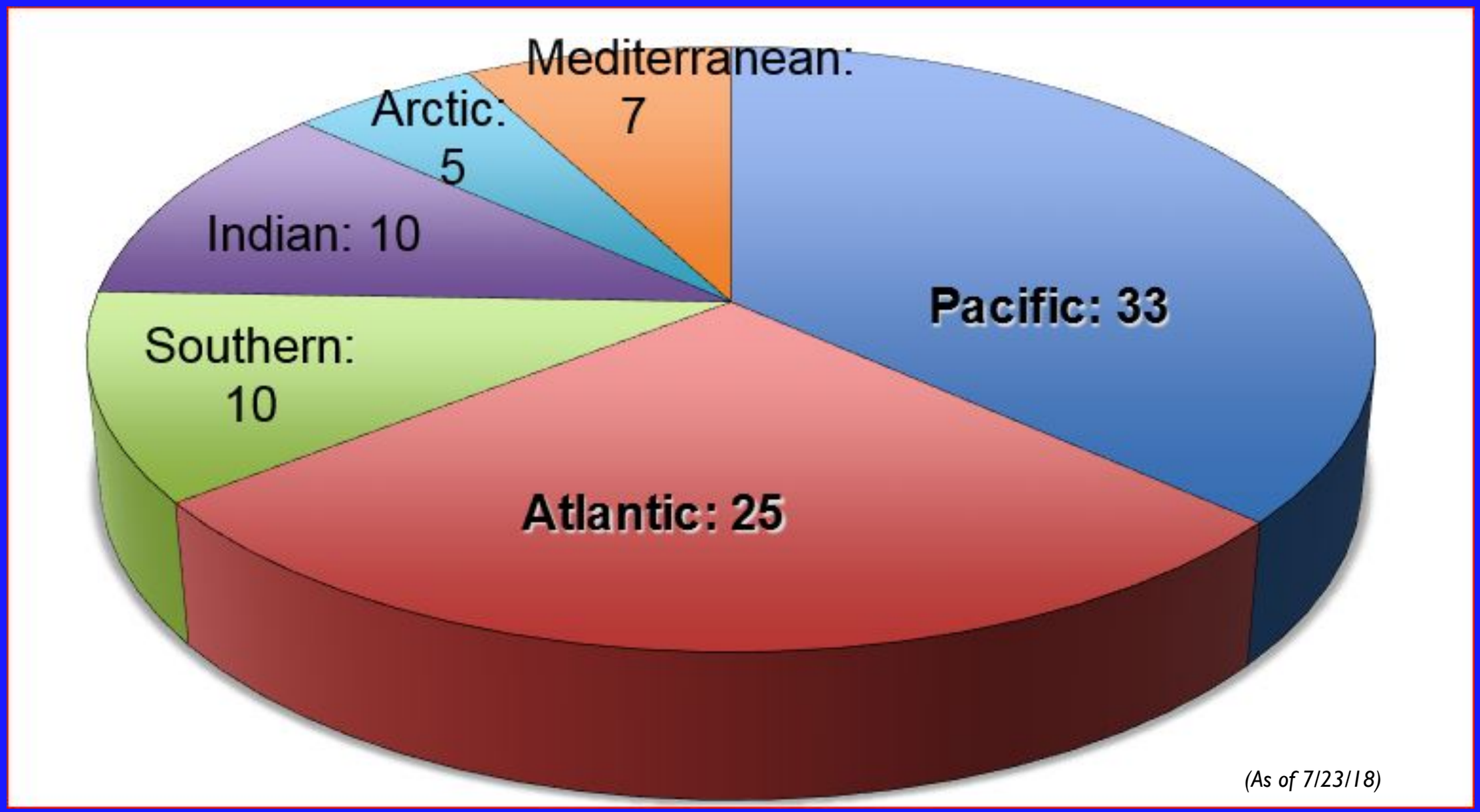
Earth in Motion

Challenge	At CIB/FBs	At SEP
12. Control of earthquakes, landslides, tsunami	NanTroSEIZE 3,4*** (603C,D) 537B CRISP B*** 781B Hikurangi Riser 835 JTRACK 866 Japan Trench Paleoseismology	770 Kanto Asperity* 796 NADIR: Nice ADP 811 Cape Fear Slope Stability 939 Tohoku Petit-Spot Magmatism
13. Storage/flow of sub-seafloor carbon	791-APL2 Cont. Margin Methane Cycling	811 Cape Fear Slope Stability 836-APL Cont. Margin Methane Cycling* 910 Cont. Margin Methane – Rio Grande 911 Argentine Margin Paleo.
14. Fluids linking sub-seafloor tectonic, thermal and biogeochemical processes	633 Costa Rica Mud Mounds 921-APL Hole 896A Biosphere 637 New England Hydrogeology	

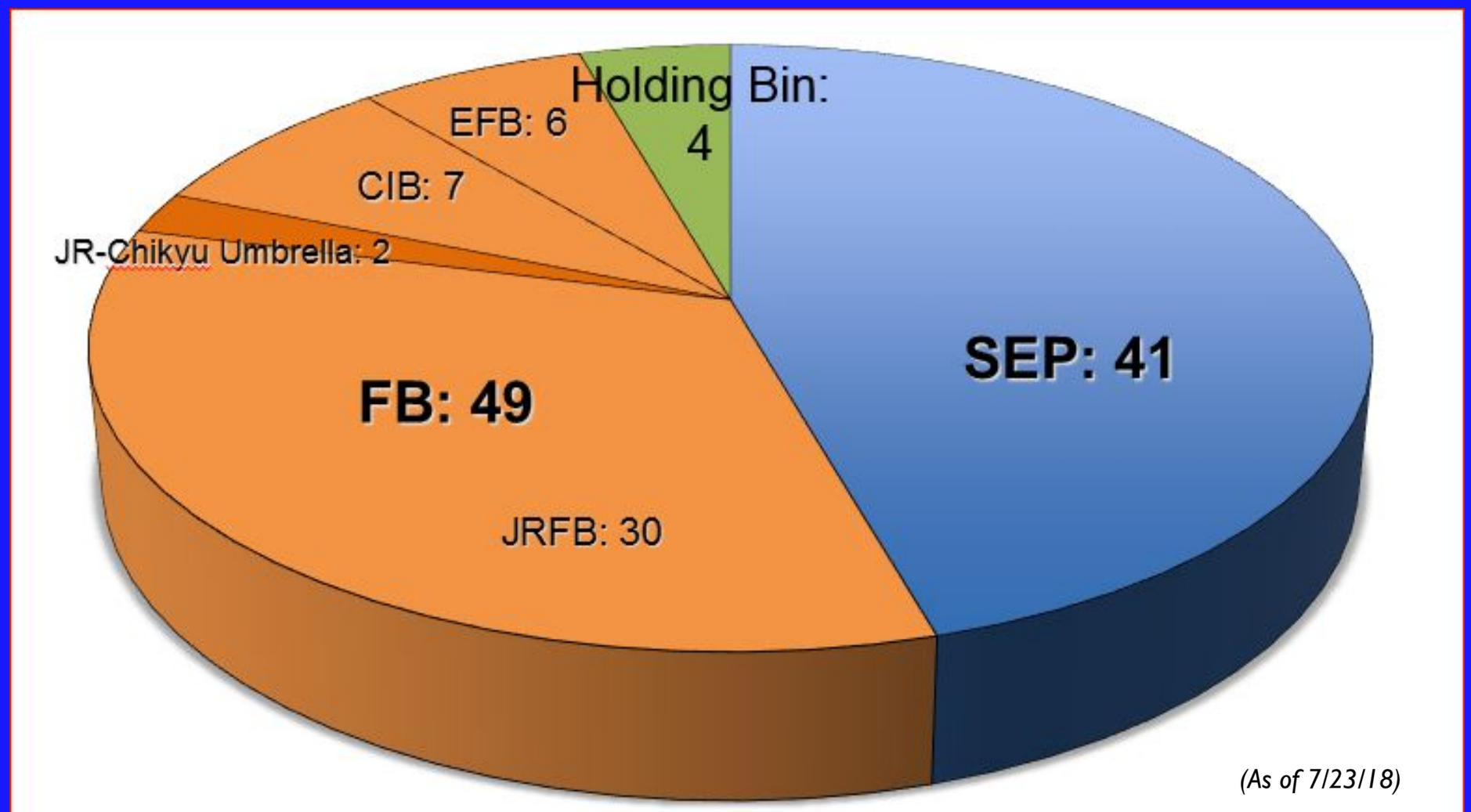
How many proposals address which challenges?



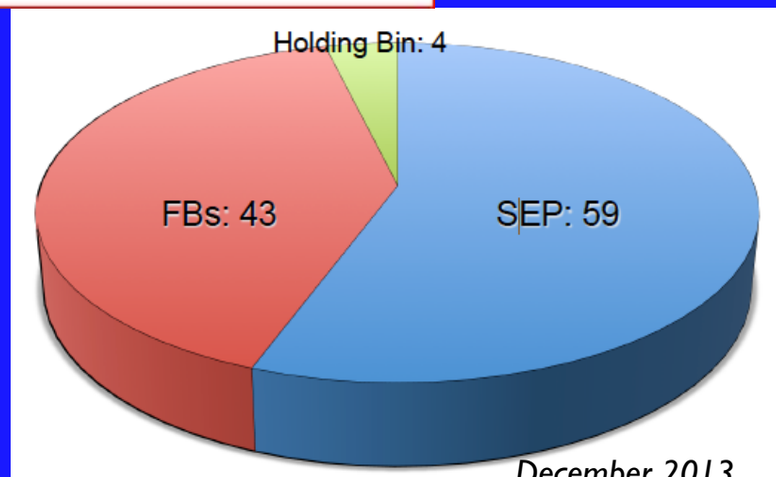
Active proposals: 90, by target ocean



Active proposal status: 90, by review stage

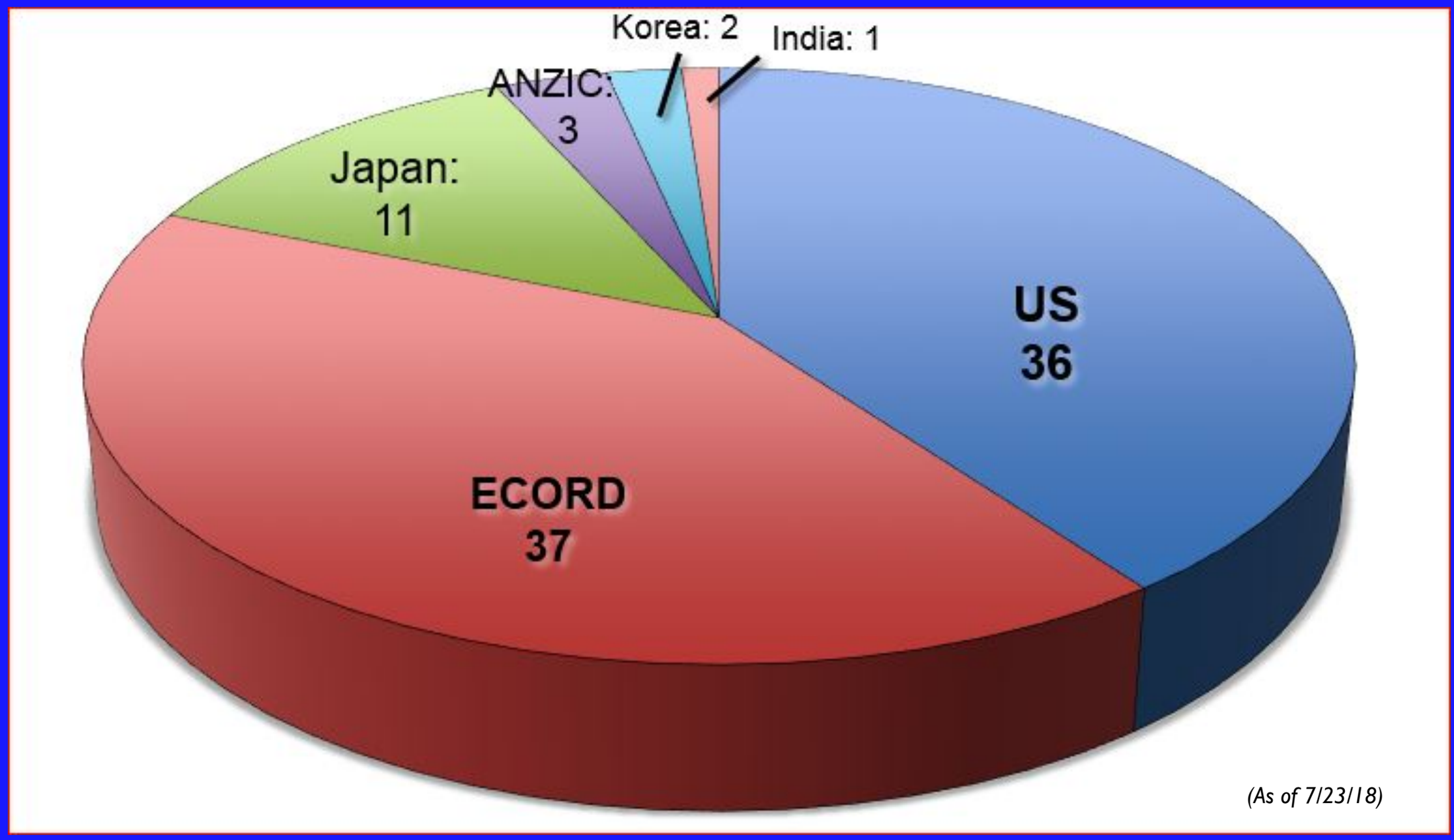


(As of 7/23/18)

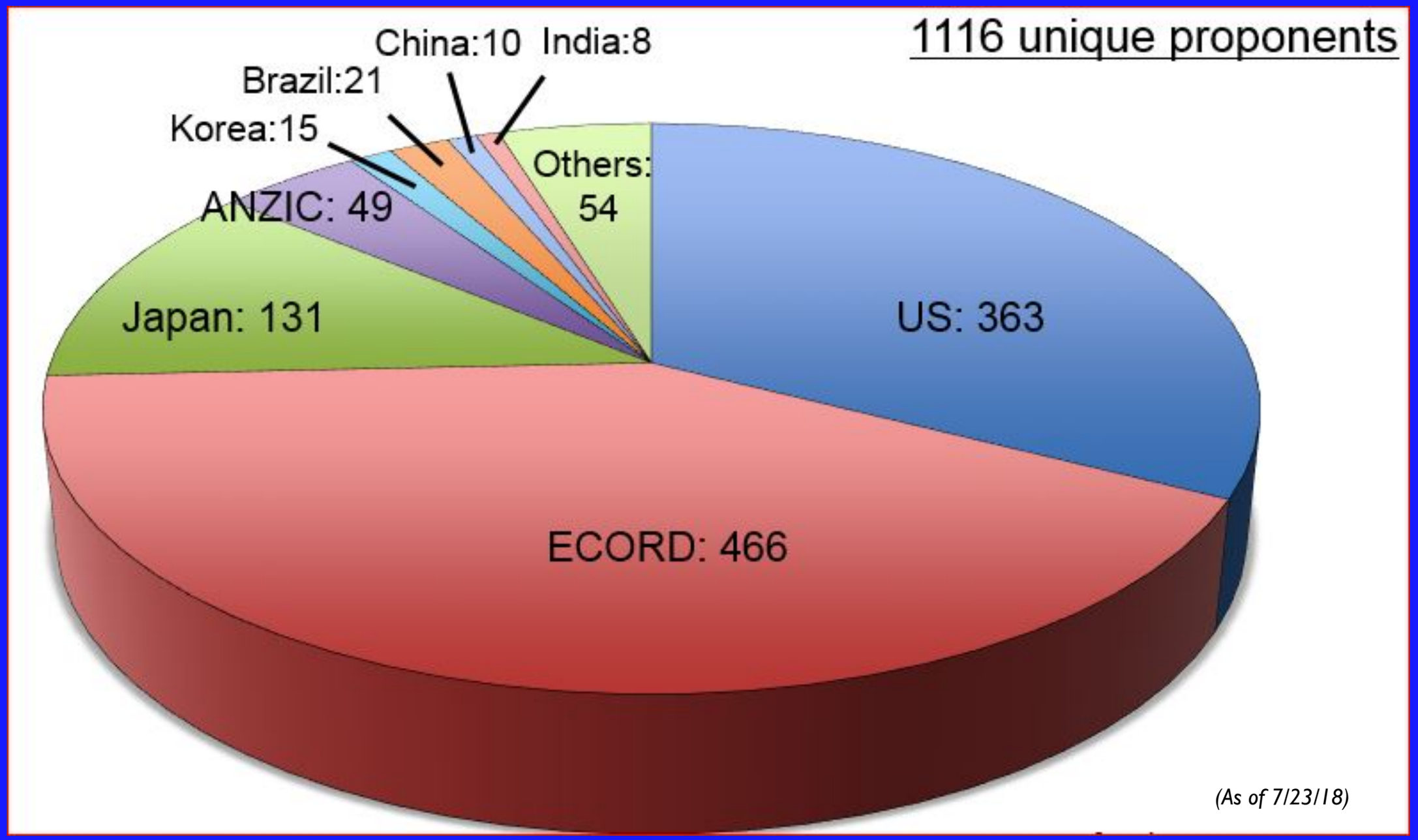


December 2013

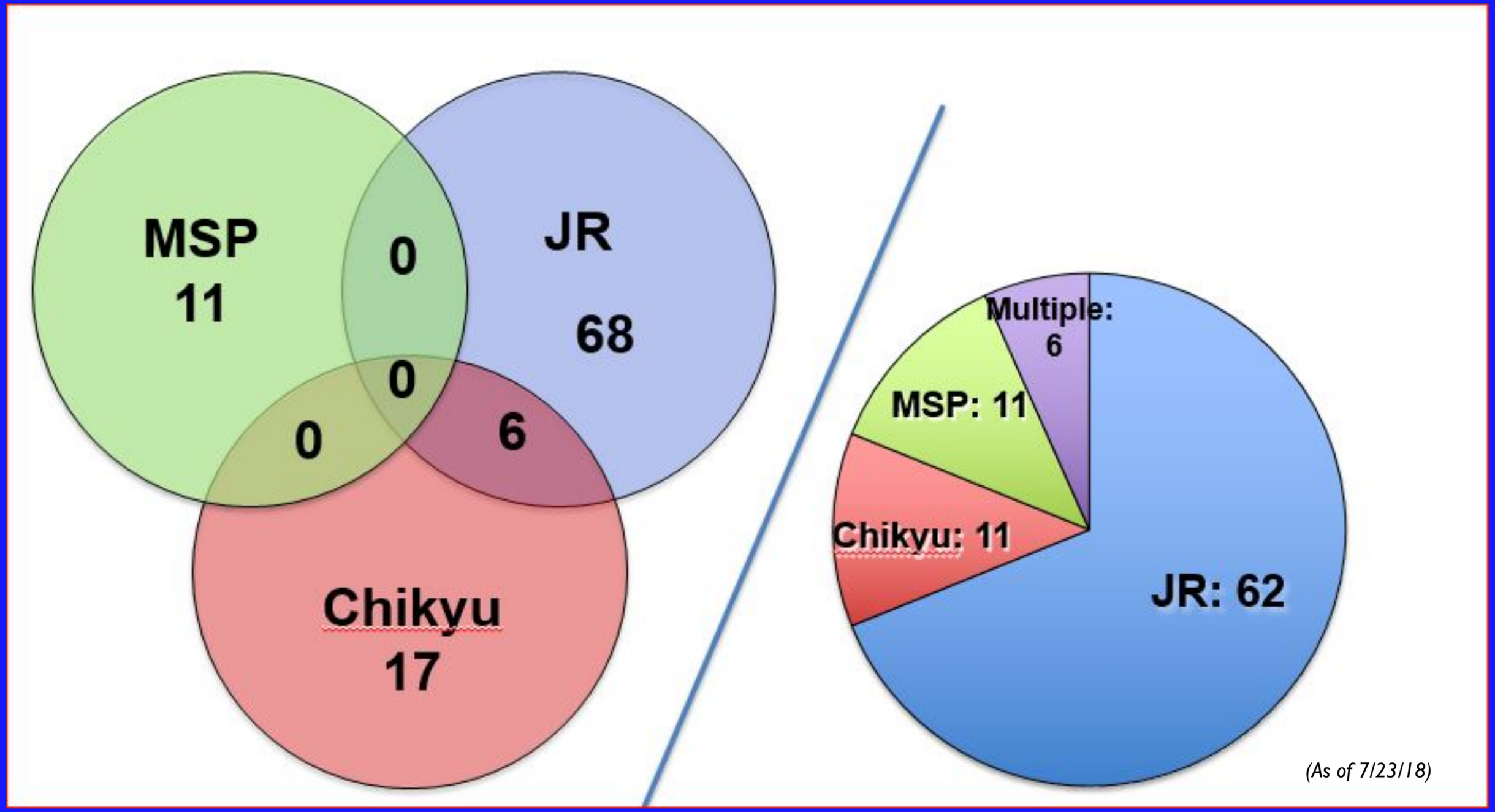
by lead proponent's member affiliation



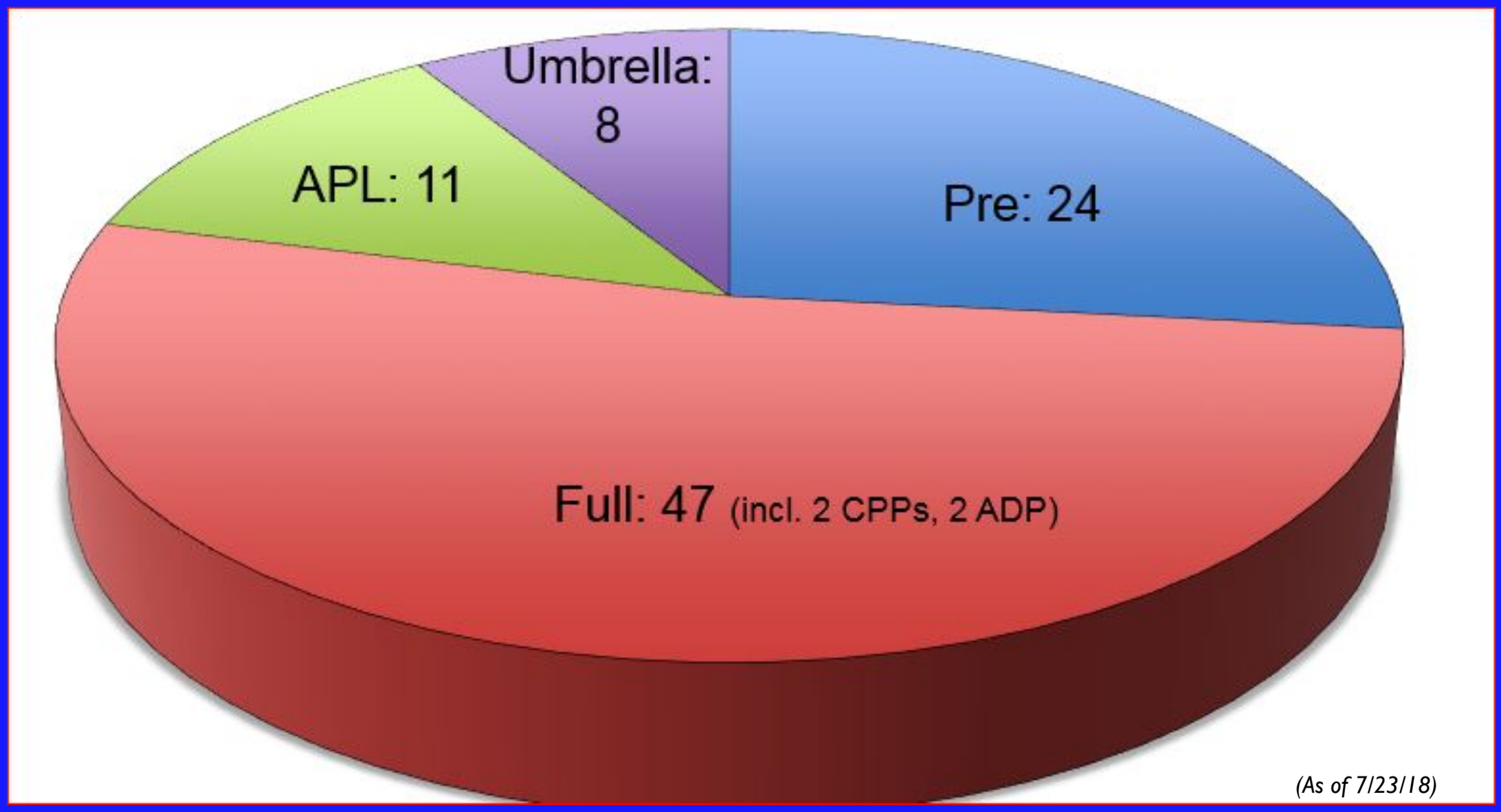
Active proponent distribution



Drilling Platforms: 90 Active Proposals



Active proposals: 90, by proposal category



(As of 7/23/18)

Parting thoughts:

- ***Overall, this phase of scientific ocean drilling is doing a good job of addressing the Science Plan's themes and challenges; however, this performance goes beyond the JR to MSP and Chikyu-hosted expeditions. The JR cannot do it all.***

- ***The body of active proposals, and the flow of new proposals, seems adequate to sustain IODP through its next phase (even with the JR at full utilization).***

- ***The assessment of how proposals and expeditions are answering the call of the Science Plan themes/challenges does not include any post-expedition assessment, by SEP/FBs/Co-Chiefs/IODP Forum,… The international scientific ocean drilling community could and should take this on as an important ongoing priority, as we begin to envision a post-2023 program.***