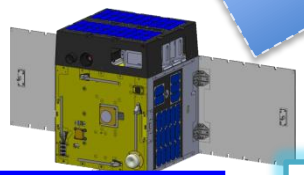
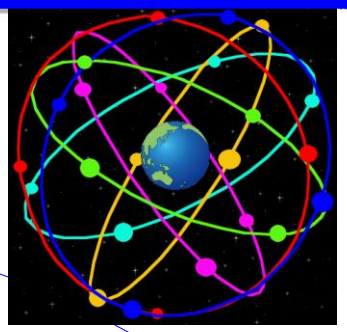
Concept of Global Network for On-Ground Sensors with Nano/Micro Satellites (Application: Water Level Monitoring)

Global network for water level monitoring

Hodoyoshi satellites #3 & #4



S&F satellite constellation



Store and Forward Communication

Collect and store water level data

Water level monitoring sensor system with low cost sensor will be developed

Water level monitoring sensor systems installed in many places in the world send data to satellites

Satellites send collected data to a ground station

Ground Station

End users who need to monitor water level in the world

inundation

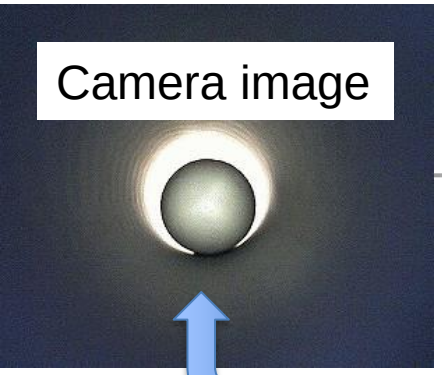
flood

drought

Internet

Automatic Analysis and distribution of data of water level

Water Level Monitoring Sensor



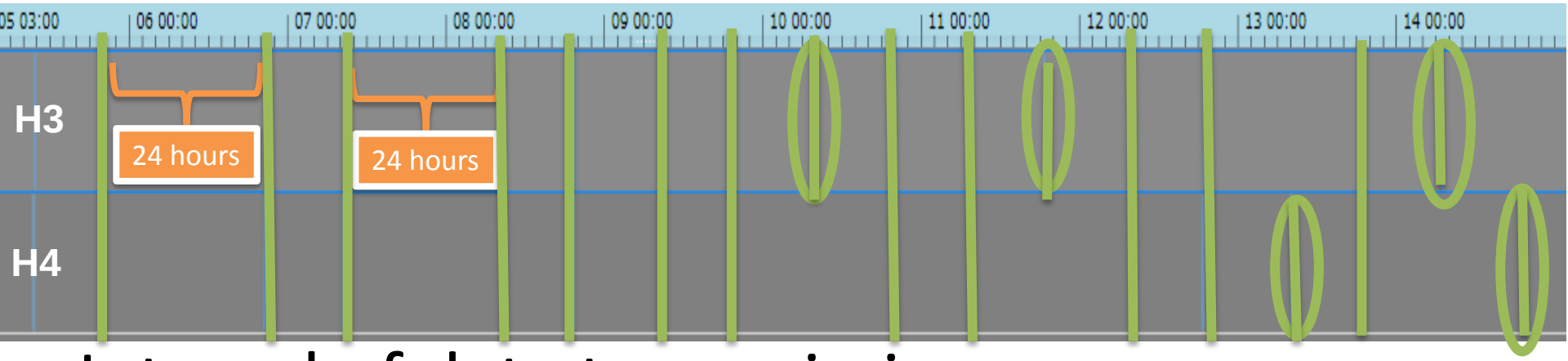
Original Concept (Abiki-kun)

Camera
Installation device
Float
Water surface
Installation device
PVC Tube
River side
Longer than 2 m
Bus system
Sensor system
Enlarged view
Transmitter
GPS
CPU
Memory
Batteries
Solar cells

Communication Link Analysis（1）

Satellite	Semi-major Axis (km)	Inclination (Deg)	Eccentricity
Hodoyoshi 3	7022 (644)	97.978	0.0035
Hodoyoshi 4	7014 (636)	97.980	0.0024

Timing of Hodoyoshi satellites flying over a sensor in Egypt



- Interval of data transmission:
  - Typical: 11 or 13 hours
  - Worst case: 24 hours

Communication Link Analysis (2)

	Ground Sensor in Egypt					Ground Station in Japan			
	Day	AOS Time (UTCG)	LOS Time (UTCG)	Duration (min:sec)	**Latency (hour:min)**	Day	AOS Time (UTCG)	LOS Time (UTCG)	Duration (min:sec)
#1	1	8:28:40	8:32:16	3:36	**2:43**	1	11:15:40	11:16:41	1:01
#2	1	19:14:48	19:18:11	3:21	**5:16**	2	00:33:46	00:37:26	3:40
#3	2	8:41:12	8:43:37	2:25	**2:43**	2	11:26:38	11:29:35.	2:58
#4	2	19:26:27	19:30:27	4:00	**5:15**	3	00:45:35	00:49:39	4:04
#5	3	19:38:23	19:42:29	4:06	**5:15**	4	00:57:33	01:01:41	4:07
#6	4	19:50:34	19:54:17	3:43	**5:15**	5	01:09:41	01:13:31	3:50
#7	5	07:41:38	07:43:50	2:12	**4:18**	5	12:01:59	12:06:05	4:06

Maximum data latency is less than 6 hours.

Discussion Group #1

- Goal: Obtain as many application ideas for S&F communication as possible
  - –Brainstorming style
  - –Categorize application ideas based on capabilities and limitation of Hodoyoshi S&F communication system
  - –Extract required capability for next generation S&F communication