# Light measurements on the Falkor Too FKt240412 cruise

Bror Jönsson lead the deployment of a Satlantic HyperPro, a profiling freefalling instrument that measures apparent optical properties of the ocean, particularly upwelling and downwelling irradiance. The main platform used during the cruise has the serial number MPR051, and the two sensors have the serial numbers HPL155 and PLD148. Data from HyperPro is hyperspectrally resolved and measures light irradiance at 134 wavelengths from 350 to 700 nm. The depth sensor can either be tared on deck or at the surface just before starting to free fall. We changed the protocol from water tare to deck tare half-way through the cruise since the latter method provided slightly more consistent depth measurements. This change has been reflected in the processing of the data and has no relevant effect on the results.

**Deployments**

The HyperPro was deployed using a protocol adapted from the HOT program where we aimed to measure three profiles down to 60 meters depth in rapid order. The actual length of the profiles varied due to currents and ship positioning. We performed the deployments at different times of the day to relfect diurnal variability in the quality and quantity of the measured light field. Normally we only did one or two deployments per day, but we were able to resolve a full day at three occasions. We also deployed the instrument in different weather conditions from clear sky to full cloud coverage. While the sea state and wind conditions varied between different deployments, it was never more than what can be described as mild conditions as is typical for the region. As a result, we believe to have captured a representative variability in light conditions for the region during the time of the cruise. We conducted a total of 43 deployments, of which 38 were successful.

Individual Deployments:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **date** | **time** | **ID** | **Profiles** | **Weather** | **Tare** | **Notes** |
| 11-May-24 | 16:57 | Hyper 43. | 60x3 | Cloudy | Deck tare |  |
| 11-May-24 | 14:13 | Hyper 42 | 60x3 | Cloudy | Deck tare |  |
| 11-May-24 | 12:22 | Hyper 41 | 60x3 | Cloudy | Deck tare |  |
| 11-May-24 | 09:31 | Hyper 40 | 50x4 | Cloudy | Deck tare |  |
| 11-May-24 | 07:23 | Hyper 39 | 45x4 | Cloudy | deck tare |  |
| 10-May-24 | 15:14 | Hyper 38. | 60x3 | Cloudy | Deck tare |  |
| 10-May-24 | 12:06 | Hyper 37 | 60x3 | Cloudy | Deck tare |  |
| 09-May-24 | 10:15 | Hyper 36 | 50x3 | Cloudy | Deck tare |  |
| 09-May-24 | 08:30 | Hyper 35 | 50x3 | Cloudy | Deck tare |  |
| 06-May-24 | 09:31 | Hyper 34 | 60x3 | Cloudy | Deck tare |  |
| 05-May-24 | 09:38 | Hyper 33 | 60x3 | Cloudy | Deck tare |  |
| 04-May-24 | 14:30 | Hyper 32 | 60x3 | Cloudy | Deck tare | Sun at 10pm |
| 02-May-24 | 10:45 | Hyper 31 | 50x3 | Cloudy | Deck tare | Sun at 12:00 |
| 30-Apr-24 | 16:26 | Hyper 30 | 50x3 | Half Shade | Deck tare | Sun at 21 |
| 30-Apr-24 | 13:34 | Hyper 29 | 50x3 | Clear Sky | Deck tare | Sun at 23:00 |
| 30-Apr-24 | 09:46 | Hyper 28 | 50x3 | Clear Sky | Deck tare | sun at 2 |
| 29-Apr-24 | 15:32 | Hyper 27 | 60x3 | Clear Sky | Deck tare | Sun at 22:00 |
| 29-Apr-24 | 12:30 | Hyper 26 | 40x3 | Clear Sky | Water tare | Sun at 1pm |
| 29-Apr-24 | 11:07 | Hyper 25 | 60x3 | Sky | Water tare | Sun at 2 |
| 29-Apr-24 | 09:09 | Hyper 24 | Failed |  |  |  |
| 29-Apr-24 | 08:30 | Hyper 23 | Failed |  |  |  |
| 26-Apr-24 | 13:00 | Hyper 22 | 60x3 | Fully cloudy | Water tare |  |
| 26-Apr-24 | 09:30 | Hyper 21 | 60x3 | Fully cloudy | Water tare |  |
| 24-Apr-24 | 15:16 | Hyper 20 | Failed. |  |  |  |
| 24-Apr-24 | 13:15 | Hyper 19 | 60x3 | Clear Sky | Water tare | sun at 8pm |
| 23-Apr-24 | 13:55 | Hyper 18 | 60x3 | Clear Sky | Water tare | Sun at 8pm |
| 23-Apr-24 | 09:58 | Hyper 17 | 60x3 | Clear Sky | Water tare | sun at 7pm |
| 22-Apr-24 | 14:12 | Hyper 16 | 60x3 | Cloudy | Water tare | Sun a 10pm |
| 22-Apr-24 | 10:13 | Hyper 15 | 60x3 | Cloudy | Water tare |  |
| 20-Apr-24 | 17:10 | Hyper 14 | 60x3 | Clear Sky | Water tare | sun at 21 from now. |
| 20-Apr-24 | 15:25 | Hyper 13 | 60x3 | perfect Sky | Water tare | Sun at at 8 a clock. |
| 20-Apr-24 | 12:37 | Hyper 12 | 60x3 | Perfect Sky | Water tare | Sun port 15 deg off to stern. |
| 20-Apr-24 | 09:58 | Hyper 11 | 60x3 | Clear Sky | Water tare | Sun in front of ship. |
| 20-Apr-24 | 08:43 | Hyper 10 | 3x60 | Clear Sky | Water tare | Sun in front of |
| 19-Apr-24 | 14:50 | Hyper 09 | 60x3 | Clear Sky | Water tare | boat shade. |
| 19-Apr-24 | 08:57 | Hyper 08 | 60x1 | Cloudy | Water tare | Chased off by Chilean navy. |
| 17-Apr-24 | 12:23 | Hyper 07 | 60x3 | Clear Sky | Water tare |  |
| 16-Apr-24 | 08:43 | Hyper 06 | 60x4 | Clear Sky | Water tare | close to ship. |
| 15-Apr-24 | 16:35 | Hyper 05 | 60x3 | Clear Sky | Water tare |  |
| 15-Apr-24 | 12:35 | Hyper 04 | 60x1 | Clear sky | Water tare |  |
| 15-Apr-24 | 08:52 | Hyper 03 | 50x3 | Clear Sky | Water tare |  |
| 14-Apr-24 | 12:55 | Hyper 02 | 50x1 |  | Water tare |  |
| 13-Apr-24 | 11:01 | Hyper 1 | test |  | Water tare |  |

**Data Processing**

The raw output from the instrument in engineering units was processed using Satlantic’s (now Seabird’s) software *ProSoft* version 7.7 to level 2. i.e. to scientific units but not mapped to depth. Calibration files used for the processing and all raw data files uwed in the processing are included in the data package delivered at the end of the cruise to the Marine Technicians on Falkor Too. The resulting data sets were further processed by converting “time” to “depth” by matching the observations from the two radiometers with depth information from the internal depth sensor in the instrument. Finally, we interpolated the data to even depth levels (each meter) and averaged repeated profiles at each respective deployment if available. The resulting data set will be publicly available after quality checks and assurances not more than six months after the cruise. We have included four example figures of downwelling irradiances in the report. Analogous figures for all deployments will be included in the data repository.

**Thanks**

Finally, we would like to thank the deck and science crew on the Falkor Too for all their help during the cruise. Their support and active work were instrumental for us to be able to do our deployments.

