INSTRUMENTS FOR SURFACE AND UPPER AIR MEASUREMENTS FROM MARINE PLATFORMS

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Summary

There are two major problems with our oceanic observational program: 1) there are insufficient observations to cover the oceans adequately, and those that are taken are poorly spaced in time; and 2) ship reports of weather are not as accurate as those taken on land.

Of the solutions offered for these problems, satellites provide the major hope for the future. Other possible solutions are buoy systems, constant level balloons, commercial aircraft observations, weather reconnaissance aircraft, and commercial shipping. The author envisions a mix of elements from each of the above, forming a substantial oceanic observing network. Eventually, with scientific advances, satellites will take over most of the work in this field.

The total system, as postulated by the author, will have four parts:

1) Control and communications
2) Surface observations
3) Upper air observations
4) Buoys

Instrumentation for ocean surface observations would eventually be automated, and monitored on shore. The following list describes the preferred sensor for each of the various parameters:

Element	Sensor
Position	IRIS, LORAN or OMEGA systems
Time	Chronometer
Pressure	Aneroid precision capsule, operating in a controlled-temperature cavity. A change in pressure moves a core within a differential transformer to provide an electrical output proportional to the change in pressure. This output is amplified and passed to the display unit to actuate the digital readout for pressure.
Air temperature	Platinum resistance wire the resistance of which is a linear function of temperature. Resistance changes the balance of a bridge network to provide an electrical output proportional to the change in temperature.
Wind speed and direction	Sonic anemometer that utilizes an electromagnetic probe and an acoustic probe, separated as far apart as possible, and intersecting at some distance from the ship. The sonic probe bombards the air with sonic pulses, causing a chemical change in the air molecules, and a change in the electric constant at the intercept point. This, in effect, produces a target which is hit by the electromagnetic probe to provide an output proportional to the movement of the target or wind velocity.
Sea temperature	Near-surface reference temperature device. A thermistor probe located in the injection intake near the skin of the ship, with remote readout at desired location.
Waves	Infrared wave measuring device, bow mounted, which scans ~15 ft ahead of the ship and measures distance to water. Ship motion must be measured and integrated with IR readings.
Humidity	Peltier effect dew-pointer. Dew formation on cooled surface sensed by small thermistor and derived temperature is amplified as an electrical signal and passed to readout point.
Precipitation	Selective precipitation indicator. An electronic instrument of composite design to sense presence of dew, frost, drizzle, rain or snow; to differentiate and report on incidence, duration and type.
Water temperature profile	Expendable bathythermograph.
Cloud height	To be computed from upper air soundings (on upper air ships only).
Sunshine duration and insolation	Photocell with automatically controlled sensitivity.

S. Teweles et al. (eds.), *Meteorological Observations and Instrumentation*