GAMBLE FINAL MEETING
Arles, November 17, 2003

Future requirements for altimeter data

-2 Sea state, offshore operations and inland hydrology applications

Luigi Cavaleri
ISMAR
S.Polo 1364, 30125 Venice, Italy
E-mail luigi.cavaleri@ismar.cnr.it

Summary of the situation
(the good points)

altimeters have provided an unprecedented amount of data concerning wind waves and wind speed. This has stimulated global-wide statistics, also where previously hardly any data existed, and the production of atlases.

The assimilation of altimeter data into meteorological and wave models has contributed to improving their performance and to extend the range of useful forecast.

(the still existing problems)

altimeter data are still relatively scarce when referred to a specific location. T/P orbits are 2.5^{o} aside, with only 40 passes/year. Reliable statistics only available for areas of 2^{o}x2^{o} square.

data accuracy still questionable in the low and very high value ranges. At extreme values there are good reasons to believe that the physics of air-sea interactions is different.

the assimilation of H_s in wave models is a rather crude operation. Data on the single spectral wave components are required, as potentially provided by SAR. SAR data assimilation is now beginning to be used by operational centres.

(the still existing problems) (cont.)

no altimeter data are available in coastal areas. In any case the orbit interval would be too large, compared to the strong spatial gradients present close to the coasts.

because of the number of satellites, the present sampling strategy is not sufficient to track the various swell systems across the oceans.

we are presently unable to forecast and to follow properly highly concentrated, violent and rapid storms, e.g. the Polar Lows.

the number of available data decrease substantially north and south of +-66^{o} respectively.

what is provided today

H_s significant wave height

T wave period (still experimental) real time (~ hours)

U wind speed

H_s T U near real time (~ days)

H_s T U climatologies offline (weeks, months)

Summary

The present satellites are sufficient to assess climatologies,although only at a relatively large (coarse) scale

It is difficult to rely only on satellites to issue timely warnings – there is a problem of *where* and *when*

The same holds for extreme values – it is unlikely to be at the right place at the right time (and do not forget the problem of physics of extreme conditions)

Summary (cont)

condition for operational users -

timely information, accurate in quantity, space and time

only one solution: synergy between satellite information and numerical operational models -

a) data assimilation in the models - analysis

b) issue of short and medium-range forecasts - validation

c) data assimilation in the models - analysis

d) ……

Summary (cont)

no particular constraint for the space and time distribution of data, provided they are dense enough

present satellites (especially for wave heights) are not satisfactory -

at 50 degree latitude 1^h 40’ corresponds to 1750 km

successive ground tracks can easily miss a storm

there is a strong need for increasing the number of satellites in a very organized pattern for optimal use

Summary (cont)

this would favour both climatologies and operational applications

It would also greatly increase the possibility of useful applications in inland waters, possible only on large bodies of water (altimeters need about 20 km to lock again on the return signal – any progress in this respect? Would it be conceivable to use an average time shorter than once a second?)

conclusion: everything points to a substantial increase of the number of satellites, particularly with altimeters -
an optimal solution: a cluster of small cheap satellites using as reference a master one