WIND ROSES FOR SEVERAL ONSHORE-OFFSHORE PROFILES AT THE EASTERN ADRIATIC COAST

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Abstract: Wind roses for three onshore-offshore profiles at the Eastern Adriatic coast (Croatia) are considered. The profiles are following: 1) the Northeast *Senj – Rab – Mali Lošinj*, 2) middle Adriatic profile *Split Marjan – Hvar – Komiža* and 3) the Southern Adriatic profile *Dubrovnik – Lastovo – Palagruža.* Time series of instantaneous (at 07 h, 14 h and 21 h of local time) wind data for period 1981–1998 have been used.
Wind roses strongly depends on spatial wind pattern i.e. wind type. Thus for the *sea breeze* conditions the winds form SW quadrant prevails for most considered weather stations, while *Ethesians* (from NW quadrant) wind prevails at Palagruža and Lastovo islands. During *jugo* (or s*irocco*), wind directions are concentrated on SE quadrant. An exception is Senj station where canalising *jugo* wind is not stressed. During *bura* (or *bora*) conditions, concentration of the wind directions is located into NE quadrant. Only one direction is very dominant at coastal locations.

Keywords: *wind roses, onshore-ofshore profiles, Adriatic sea*

1. INTRODUCTION

Winds in the Eastern Adreatic are well known to sailors and some of them are rather terrified. Especially *bura*, that can hit sailors, unfamiliar with the local conditions, suddenly and with great strength in otherwise calm weather. It is a katabatic wind coming out of the coastal mountains, therefore it comes in most cases out of north-easterly dirctions and can reach up to storm force in the gusts.

Another important wind in this region is *jugo*. It is a relatively warm wind origined in the Sahara flowing to the north in the warm sector of a low pressure systems. Therefore it is coming from southerly directions, it is often dusty and contains a high amount of moisture when it reaches the Adriatic sea. Here it flows in most cases along the coast, which means from the south-easterly directions. In comparison with *bura* it blows continuosly and has a litlle lower speed, but can frequently reach 6 Beauforts (Bft) or more. *jugo* can appear in every season, but it is to some extent more frequent during spring and autumn.
The *ethesians* appear mainly in summer season and reach their maxima in July and August. They are blowing from the high pressure system at the Azores to the Karachi-Depression and they are therefore coming from the north-west. They have mostly only moderate speed.

Further, *land* and *sea breezes* are caused by temperature differences between the land and the sea surface and they are of great importance for the wind regime during the summer. The *maestral* is an superposition between *ethesians* and *sea breezes*.

Wind roses for 9 weather stations, locateded on three profiles about perpendicular to the Eastern Adriatic coast (Fig. 1) are compared.

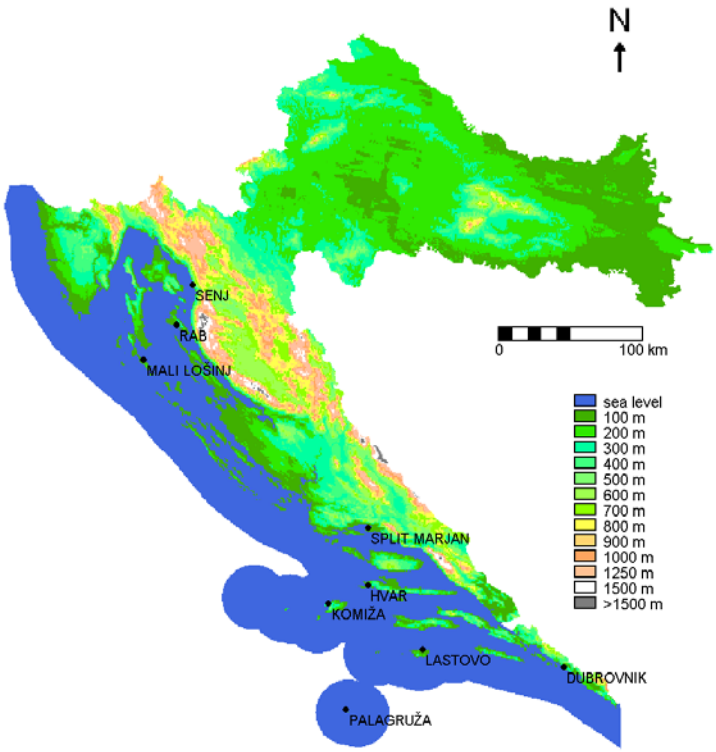

Figure 1. Map of Craotia showing the position of the regarded weather stations

2. DATA

The nine stations choosen are laying in the Eastern Adriatic along three profiles. Each profile contains one station at the coast of the mainland and two stations on islands of different distance offshore. The measurements where taken three times per day, at 7 h, 14 h and 21 h local time by human observers. These times are used in Croatian climate records to measure as close as possible to the time of lowest, highest and meadium temperature of the day. The wind direction was recorded in 16 intervals and the wind speed in Beauforts (Bft).

3. RESULTS

The number of wind events of one direction and speed interval was counted for the whole year, for the summer months (June, July, August), the winter months (December, January, February) and for times of certain typical wind field pattern for the period from 1981 to 1998 (Pandžić and Likso, 2005). The wind speed was devided in five intervals: smaller than 4 Bft, 4-9 Bft, 9-15 Bft 15-22 Bft and more than 22 Bft. Of the typical wind field pattern derrived by Pandžić and Likso (2005) six where chosen favourable for *land breeze*, *sea breeze*, *jugo* and different types of *bura*.

For each wind type the events where counted during the three months. The percentage was calculates to the maximum of possible wind measurements in the regarded interval (eather 12 or three month) in the chosen period (18 years, including four leap years).

Figure 2 shows cases, when *bura* is stronger in the Northern Adriatic than in the Southern. All stations show relatively strong wind from the north-easterly directions, typically for *bura*. As it was assumed, the highest percentage of this wind appears in Senj, the northern most coastal station, where ENE is nearly the only possible wind direction under these conditions. Towards south, for the costal stations this percentage becomes lower and fewer cases of strong wind take place.

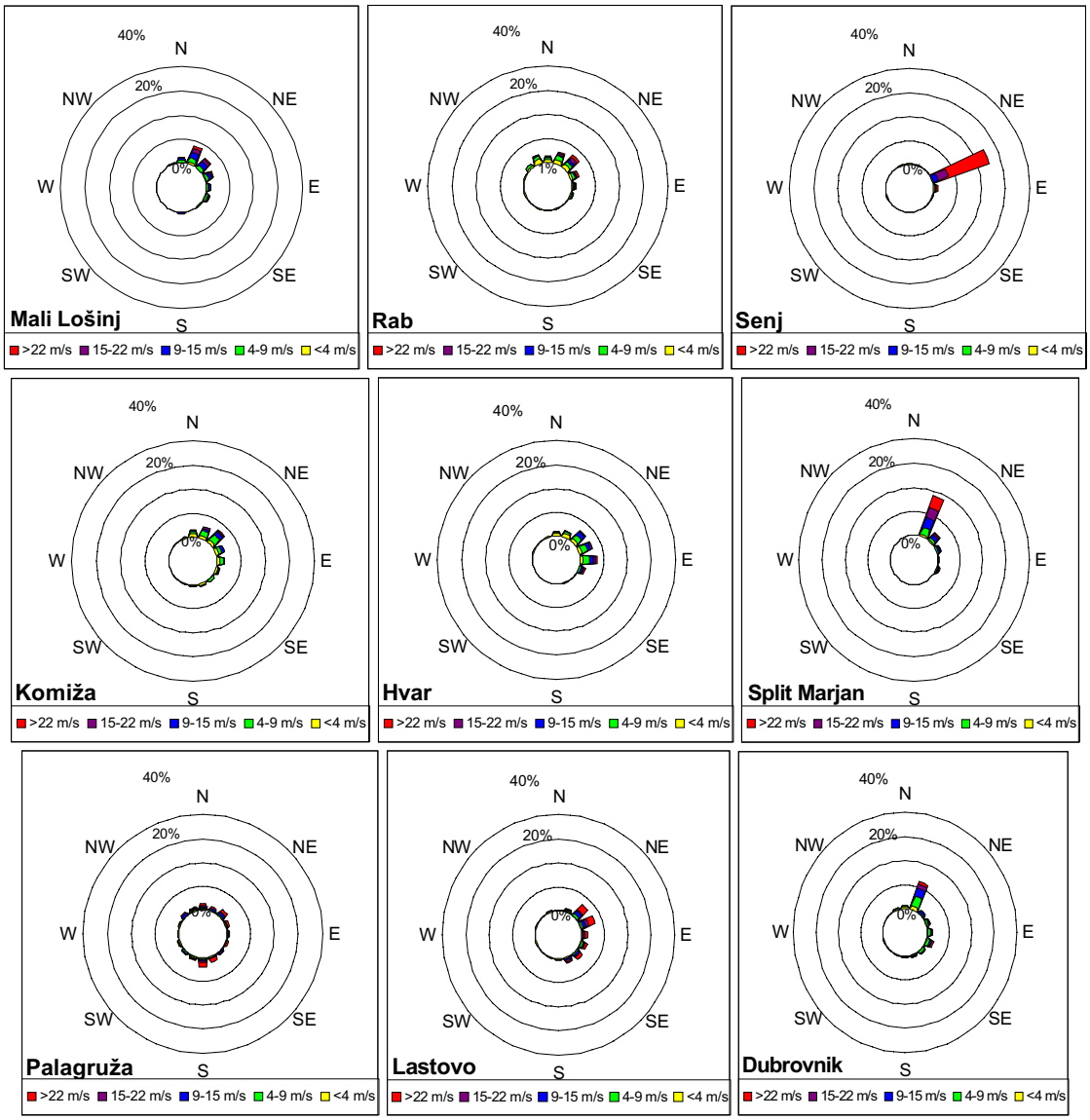

Figure 2. Wind roses for weather stations in the Eastern Adriatic for *bura* wind type (November, December, January 1981-1998).

4. CONCLUSION

The wind regime along the Eastern Adriatic coast depends on the distance from the coast as well as the position in the north-south direction. *Bura* has the strongest effect near the coast of the mainland but it also shows some weaker influence up to the islands furthest offshore. Most of other winds are influenced in their strength and frequency by the position. While for *jugo* mainly its direction is affected. Wind roses for a particular wind type elucitade wind characteristics in more details than general wind roses.

REFERENCES

Pandžić, K. and T. Likso, 2005: Eastern Adriatic Typical Wind Field Patterns and Large-Scale Atmospheric Circulation. *International Journal of Climatology,* **25,** 81–98.