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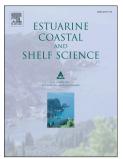
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10 Abstract One of the services provided by coastal ecosystems is wave attenuation by vegetation, and 11 subsequent reduction of wave loads on flood defense structures. Therefore, stability of veg-12 etation under wave forcing is an important factor to consider. This paper presents a model 13 which determines the wave load that plant stems can withstand before they break or fold. 14 This occurs when wave-induced bending stresses exceed the flexural strength of stems. Flex-15 ural strength was determined by means of three-point-bending tests, which were carried out 16 for two common salt marsh species: Spartina anglica (common cord-grass) and Scirpus mar-17 itimus (sea club-rush), at different stages in the seasonal cycle. Plant stability is expressed 18 in terms of a critical orbital velocity, which combines factors that contribute to stability: 19 high flexural strength, large stem diameter, low vegetation height, high flexibility and a low 20 drag coefficient. In order to include stem breakage in the computation of wave attenua-21 tion by vegetation, the stem breakage model was implemented in a wave energy balance. 22 A model parameter was calibrated so that the predicted stem breakage corresponded with 23 the wave-induced loss of biomass that occurred in the field. The stability of Spartina is 24 significantly higher than that of *Scirpus*, because of its higher strength, shorter stems, and 25 greater flexibility. The model is validated by applying wave flume tests of Elymus athericus 26 (sea couch), which produced reasonable results with regards to the threshold of folding and 27 overall stem breakage percentage, despite the high flexibility of this species. Application of 28 the stem breakage model will lead to a more realistic assessment of the role of vegetation 29 for coastal protection. 30

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