INTRODUCTION

Indonesia is an archipelago located between two Ocean, the Indies and the Pasific ocean. Indonesia is a meeting area of three large tectonic plates, namely the Indo-Australian plate, Eurasian plate, and the Pacific plate. The Indo-Australian Plate collides with the Eurasian plate off the coast of Sumatra, Java and Nusa Tenggara, while with the Pacific in northern Irian and northern Maluku. Around the location of these plates, the collision energy accumulation collects to a point where the earth's layers are no longer able to hold the pile of energy so that they release it in the form of earthquakes. This quick energy release causes various impacts on buildings due to the acceleration of seismic waves, tsunamis, landslides, and liquefaction. In 2018, tsunami happened twice, namely in Central Sulawesi and the Sunda Strait. Tsunami waves are the most common progressive gravitational waves produced by underwater mega-thrust fault movements. Their periods range from 90-7000 seconds (1.5 minutes to 2 hours) [1], and they have enough potential energy to present a significant threat to coastal life and the artificial environment.Thetsunamiwavesarestronglyinfluencedbythe subaerial fluvial morphology of the valley [2]. Reconstruction of tsunami flows across vast coastal plains, including coastal plains, has clarified the effects of local topography, artificial
structures, and land use on tsunami flows [3] [4] [5]. Subaerial topographic differences, such as elongated valley profiles, affect tsunami runup [2] [6]. One characterization of tsunami interactions with coastlines is its runup. Runup is defined as the vertical height above the surface of static water from the maximum inundation point of the tsunami land. This is a parameter commonly used to describe tsunami-like waveforms in the laboratory [7] [8] [9] [10] [11], in assessing tsunami interactions with coastlines, specifically for risk analysis, planning and insurance [12]. Maximum runup occurs because of the offshore period and amplitude. Application of specific energy heads to assess tsunami inundation at coastlines by entering the depth of flow and velocity [13] . This parameterization is necessary when consideration of the flow and velocity of tsunamis on land is desirable. However, runup links to offshore tsunami parameters remain important to improve mitigation techniques and coastline planning. This study focuses on runup as a parameter describing the interaction of tsunamis with coastlines.
Mangroves are characteristic of the shape of coastal plants, estuaries or river mouths, and deltas in protected areas of the tropics and sub-tropics. Because of its life near the coast, mangroves are often also called coastal forests, tidal forests, brackish forests, or mangrove forests. The term mangrove itself in Indonesian is the name of one of the species making up the mangrove forest, namely Rhizophora sp. So that in the scientific field not to create a bias between mangroves and mangroves, mangrove forests have been established as a standard term to refer to forests that have characteristics of life in coastal areas. Mangrove forests are often called mangrove forests or brackish forests. Named the mangrove forest because most of its vegetation is dominated by mangrove species, and is called brackish forest because the forest grows on land that is always flooded by brackish water. The meaning of mangrove in plant ecology is used for shrubs and trees that grow in shallow intertidal and subtidal areas in tropical and subtropical tidal swamps. The mangrove area is characterized by typical mangrove plants, especially species of Rhizophora, Bruguiera, Ceriops, Avicennia, Xylocarpus, and Acrostichum [14] . Also found are types of Lumnitzera, Aegiceras, Scyphyphora, and Nypa [14]. Mangroves tend to form density and diversity of stand structures that play an essential role as sediment traps and protection against coastal erosion. Plant sediments and biomass are closely related to maintaining efficiency and acting as a buffer between the sea and land, are responsible for their capacity

to absorb wave energy, and prevent intrusion of seawater to land. Higher plants also produce habitats for protection for young animals, and their surface is useful as an attachment and growth substrate for many epiphytic organisms. Mangrove ecosystems are ecosystems located in coastal areas that are affected by tides so that the floors are always flooded. Mangrove ecosystems are among the highest tide levels to levels around, or above-average sea level in protected coastal areas and are supporting various ecosystem services along coastlines in the tropics. The benefits of mangrove ecosystems related to physical functions are as disaster mitigation such as wave dampers and hurricane winds for the area behind it, shoreline protection from abrasion, tidal waves (tides), tsunamis, silt retaining and sediment traps transported by surface water flow, prevention of seawater intrusion to the mainland, and can neutralizing water pollution to a certain extent . Other benefits of this mangrove ecosystem are as objects of natural tourist attractions and ecotourism attractions and as a source of medicinal plants. One way to reduce human and economic losses from future tsunami events is through increased understanding of tsunami inundation on the coastline. Such improvements could lead to better technical guidelines for coastal infrastructure that are at risk of significant tsunami events. This research is conducted to analyze the comparison of runup results from tsunami wave simulations that are influenced by the effects of mangroves and non-mangroves. At the mangrove beach, the simulation has been carried out five times by making simulations at different angles, namely at a angles of 6, 7, 8, 9, and 10 degrees. The numerical model used to simulate a tsunami is half linear shallow water equations, where shallow water equations are a hyperbolic system equation commonly used to visualize the movement of waves in an ideal fluid. Tsunami simulations using shallow water equations have been carried out by [15] [16]. In this study Staggered grid is used to help discrete half linear shallow water equations. To complete this paper, the organization of this paper is developed as follows. In Section II the half linear shallow water model, mangrove forest, and staggered scheme for SWE model will be describe. Moreover, discussion of results the numerical model is elaborated in Section III. Finally, the conclusion is given in section IV.