

## Contents

<b>1</b>	<b>Introduction</b>	<b>2</b>
1.1	Restatement of the tasks . . . . .	2
<b>2</b>	<b>Assumption and Notations</b>	<b>2</b>
2.1	Assumptions and Justifications . . . . .	2
2.2	Notations . . . . .	2
<b>3</b>	<b>Model Design and Justification</b>	<b>2</b>
<b>4</b>	<b>Results</b>	<b>2</b>
<b>5</b>	<b>Sensitivity Analysis</b>	<b>2</b>
<b>6</b>	<b>Strengths and Weaknesses</b>	<b>2</b>
6.1	Strengths . . . . .	2
6.2	Weakness . . . . .	2

# 1 Introduction

A:High frequency wave can travel long distance by reflecting back and force from the ground and the ionosphere. The energy of the wave will be attenuated during the process of the propagation especially when the wave is reflected by the ionosphere and the surface of the ground or the sea. It is commonly acknowledged that the reflection on a turbulence ocean surface will cause larger energy loss while compared with the loss of energy in the reflection on calm sea, which may be due to the variation of height, reflection angle, and local permeability of the ocean surface. Therefore, it is worthy of detailed analysis how much difference lies between these two situations.

## 1.1 Restatement of the tasks

Our basic task is to establish a model simulating the change of the countries' fragility based on the change in climate factors.

- Construct a model which can simulate the multi-hop process between the ionosphere and the sea surface.
- Construct a model of a turbulent sea surface

# 2 Assumption and Notations

## 2.1 Assumptions and Justifications

To focus on the main problem, we make the following well-justified assumptions.

- **EWe represent climate change as + +.**
- **EClimate change has almost even impact on all regions of the world.** Climate change is a global trend. Although it may cause severe disasters in certain regions of the world during a certain period, these disasters will just result in regional increase of fragility, which are not representative while they are compared with a global trend of the change in fragility. Thus, we can assume an even impact of climate change
- **AThe scenario of skip fading is not considered.** Skip fading happens during sunrise and sunset when the frequency of the wave is near maximum usable frequency. The wave will fade and lead to the fluctuations in the ionosphere. [\*\*\*\*\*cite
- **A?The height of the ionosphere form the ground where the HF wave is reflected is set to be ....????km.** HF signals are mostly attenuated and reflected in F2 region of ionosphere.
- **A?The loss of energy of the waves when they propagate in the air is neglected.**

## 2.2 Notations

All the variables used in this paper are listed in Table 1.

Symbol	Definition	Units
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Table 1: Symbol Table.

### **3 Model Design and Justification**

### **4 Results**

### **5 Sensitivity Analysis**

### **6 Strengths and Weaknesses**

#### **6.1 Strengths**

#### **6.2 Weakness**

## References

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## Appendix