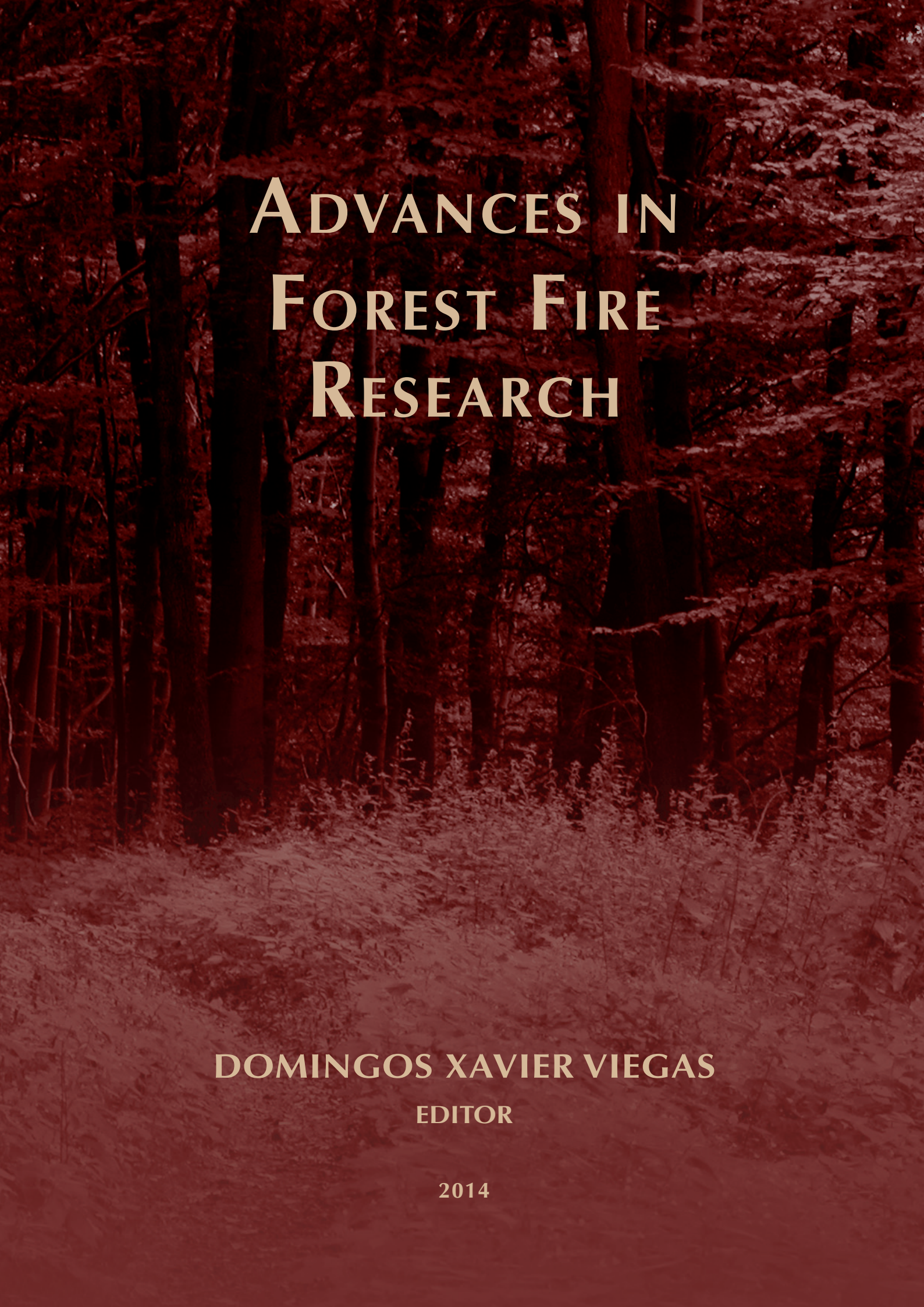

# Advances in Forest Fire Research

DOMINGOS XAVIER VIEGAS

EDITOR

2014

# The analysis and simulation of forest fire on Pohang-Si and Uljoo-Kun in Korea

Si-Young Lee[a], HoungSek Park[b], Chun-geun Kwon[a], Chan-ho Yeom[a]

[a] *Professional Graduate School of Disaster Prevention, Kangwon National University, Samcheok, Gangwon-Do, South Korea, lsy925@kangwon.ac.kr*
[b] *Dongguk University, Chung-Ku, Seoul, South Korea, parkhs08@nate.com*

**Abstract**
The forest fire in Korea was occurred by human activities. Recently, forest fires intended to damage not only forest and related regions but also urban facilities like houses, buildings and citizens. In this study, we simulated the fires which occurred on wildland–urban interface in Pohang-Si and Ulju–Gun in spring, 2013. And we compared real damages of facilities in wildland interface with simulated damaged for applying in Korea forest environment. These results would be good reference data for the prediction about danger zone in wildland-urban interface.

***Keywords****: Wildland-urban interface, forest fire simulation, FARSite , Forest fire danger zone, fire intensity*

## 1. Introduction

The forest fires in wildland-urban interface especially damaged in human and their properties. Therefore, many researchers have studied about environments in which were more danger (forest floor, topography, weather, the location of houses and etc.). And they classified with danger zone and safety zone in wildland–urban interface from forest fire. Moreover they have developed the treatment for reducing forest fire damages (the fuel treatment, the removal of flammable matter, the change of building material and etc.). In these studies, we investigated the forest fire which occurred in Pohang-Si and Ulju-gun in Korea in 2013. These fires occurred in wildland–urban interface and forest fire in Pohang-SI ignited in mainly urban area and spread in forested area. So, many houses-even 15 floors apartment-were damaged by these forest fires. Because these fire destroyed 30 buildings and facilities, we could analyzed relationships with forest fire intensity and the condition of destroy from forest fire.

## 2. Methods

We investigated damaged area for measuring and surveyed an area burned, officers and residents for estimating forest fire damages, forest fire velocities and damaged area. After field surveys, we simulated the forest fires by FARSite for obtaining a detailed forest fire damage data.…

### 2.1. Field survey

Field surveys were carried out from May to June on Pohang-Si and Ulju-Gun in 2013. We surveyed total burned area and damaged facilities and houses. And we investigated the topographical conditions (a degree, an aspect and an elevation) and forest floors (a density and main species) around damaged building. And we surveyed official records about these fire for getting damage data and forest fire velocities detailed. …

### 2.2. Forest fire Simulation

For analysis relationships with forest fire intensity and conditions around damaged buildings, we used simulation, FARSite which was developed by USDA. FARSite simulated a detailed data about forest fire intensity, burned area, forest fire velocity from topography, weather and forest species. Topographical data were acquired from D.E.M. Weather data were input by an editor contained in FARSite. Forest floor data were getting from digital forest floor map made by K.F.R.I.. These data were processed by ARCGIS 9.3 and inputted in FARSite. FARSite made many data simulated. A fireline intensity, a flame length, a time for arrival, heat per rate from forest fire and burned area were acquired

## 3. Results

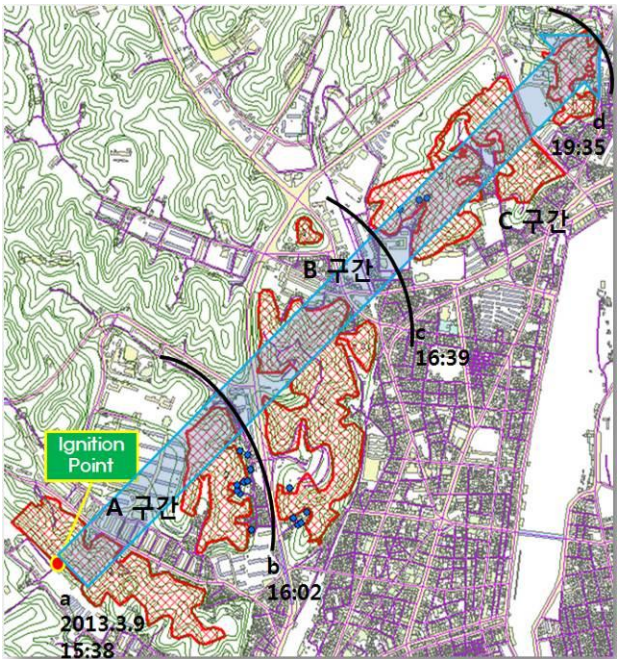


*Figure 1. The result of field survey in Pohang-Si*

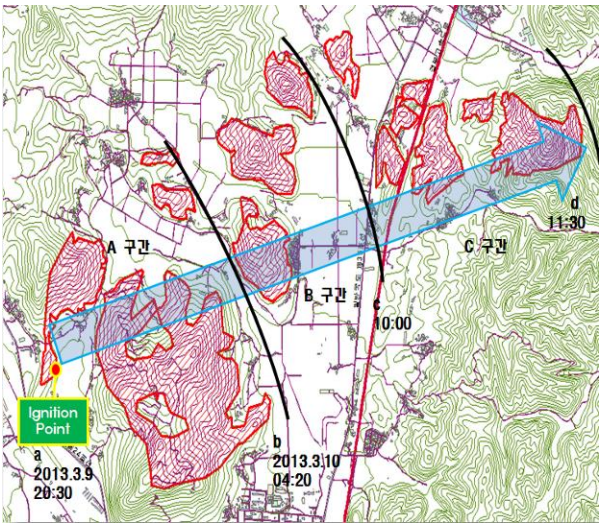


*Figure 2. The result of field survey in Ulju-kun*

The Pohang forest fire directly moved 3km from 20:30 P.M. 2 March and burned for 237 minutes. 79ha forested area and 110 buildings were damaged. 10 houses and one garage were destroyed wholly. The average velocity was 0.8km/hr. The Ulju forest fire directly moved 5.4km from 20:30 P.M. 9 March and burned for 900 minutes. 280ha forested area and 57 building was damaged. 15 houses and 3 buildings were destroyed wholly. The average velocity was 0.4km/hr.
The burned area from simulation was 184% larger than real burned area and the reason of this difference may be caused by forest fire attack. The average speed of spread was 0.12km/hr in simulation and 0.4km/hr in real fire. The results was similar to former simulation for Samcheok forest fire. The real fire was 3 times faster than real fire because of fuel condition maybe. The average fireline intensity from simulation of Ulju forest fire was 1,255kw/m and the average fireline intensity around destroyed building was 331.85kw/m. The average flame length from simulation of Ulju forest fire was 3.5m and the average flame length around destroyed building was 1.5m. As the results of fireline intensity and flame length were compared with U.S. Wildland-urban interface forest fire assessment guide made by N.W.C.G., this result indicate that Ulju fire was very serious state. Using these results, we analyzed and classified degree and the location of mountainous contour which divided 10class by elevation. The danger zone was classified in over 15 degree and over 3/10 location by elevation

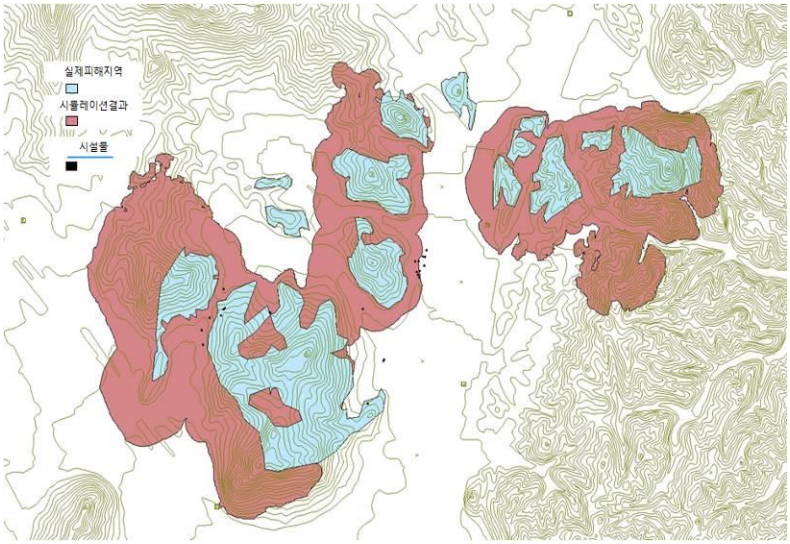


***Figure 3. The comparison with simulated burned area , real burned area and locations of destroyed building***

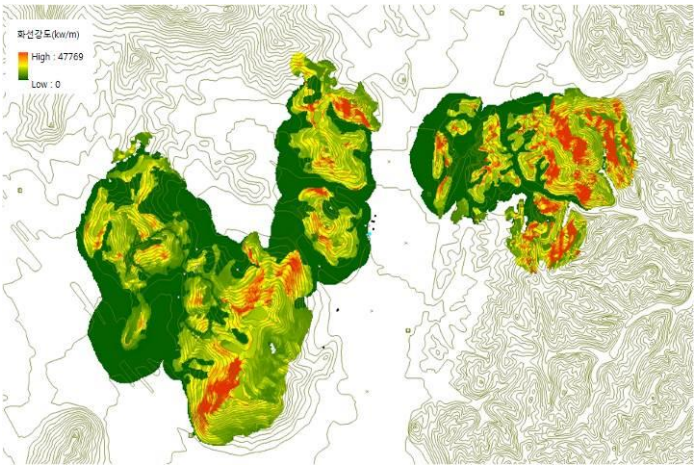


***Figure 4– The result of simulation in fireline intensity***

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