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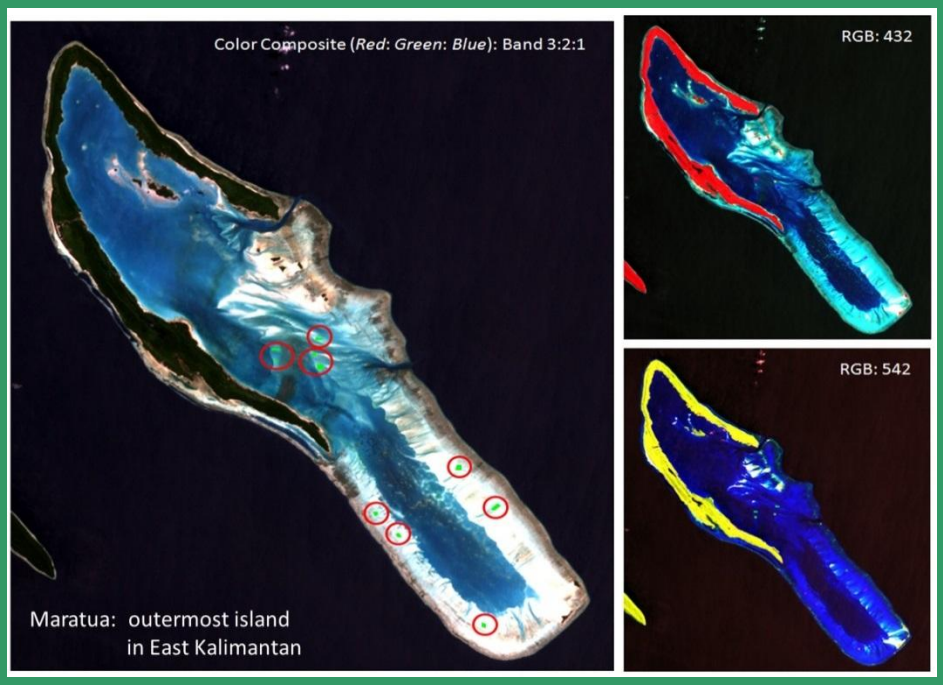

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Editorial Committee Preface

Dear Readers,

Welcome to the International Journal of Remote Sensing and Earth Sciences Vol. 9 No. 2, December 2012. This journal is expected to enrich the serial publications on earth sciences, in general, and remote sensing in particular, not only in Indonesia and Asian countries, but also worldwide.

The contents of this journal are particular interest to remote sensing as the main data for geosciences, oceanography, marine biology, fisheries, meteorology, etc. Inside this ninth edition, there are varieties of topics discussed, including the use of MODIS data, interpolation techniques for DEM generation, the effect of spatial resolution of Landsat ETM data, automated cloud and cloud-shadow detection, ship detection using PI-SAR-L2 data, oceanography parameter extraction based on SPOT and Landsat-ETM data, coastal upwelling, and an early warning system for forest/land fire.

This journal is intended, among others, to complement information on Remote Sensing and Earth Sciences, and also encourage young scientists in Indonesia and Asian countries to contribute their research results. Therefore, we would like to invite scientists to manifest their ideas through scientific research papers. We are looking forward to receiving your manuscripts for the next edition of this journal.

Editor-in-Chief,

Dr. Bidawi Hasyim

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Contribution Paper to:

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ABSTRACT

COMBINATION OF SPECKLE DIVERGENCE AND NEIGHBORHOOD ANALYSIS TO CLASSIFY SETTLEMENT FROM TERRASAR-X DATA/ M. Rokhis Khomarudin; Agung Indrajit
IJReses, 9 (1) : 1-12

The objectives of this research were to develop and improve methods for determination of settlements area with focus on synthetic aperture radar (SAR) data. Remote sensing settlement classification has made great progress, both for optical and radar data as well for their fusion. Yet, in radar imagery, settlement classification still contains some problems. Several studies on application of radar imagery have been conducted using techniques such as textural analysis, multi-temporal analysis, statistical model, spatial indexes, and object-based classification. Most of the development methods have several problems in the specific area especially in the tropical country. Several studies also showed that settlement classification accuracies were just below 60%. This was not sufficient enough to classify settlement areas using SAR imagery. Therefore, in this research, we proposed a new method i.e., the combination of the speckle divergence and the neighborhood analysis. The proposed method was applied to classify settlement area in Cilacap and Padang Districts of Indonesia. The results showed that the proposed method produced a good accuracy i.e., 85.5% for Cilacap Districts and 78.1% for Padang Districts.

Keywords: *Settlements areas, Speckle divergence, Neighborhood, SAR*

LAND COVER CLASSIFICATION OF ALOS AVNIR DATA USING IKONOS AS REFERENCE / Bambang Trisakti;Dini Oktavia Ambarwati

IJReses, 9 (1) : 13-20

Advanced Land Observation Satellite (ALOS) is a Japanese satellite equipped with 3 sensors i.e., PRISM, AVNIR, and PALSAR. The Advanced Visible and Near Infrared Radiometer (AVNIR) provides multi spectral sensors ranging from Visible to Near Infrared to observe land and coastal zones. It has 10 meter spatial resolution, which can be used to map land cover with a scale of 1:25000. The purpose of this research was to determine classification for land cover mapping using ALOS AVNIR data. Training samples were collected for 11 land cover classes from Bromo volcano by visually referring to very high resolution data of IKONOS panchromatic data. The training samples were divided into samples for classification input and samples for accuracy evaluation. Principal component analysis (PCA) was conducted for AVNIR data, and the generated PCA bands were classified using Maximum Likehood Enhanced Neighbor method. The classification result was filtered and re-classed into 8 classes. Misclassifications were evaluated and corrected in the post processing stage. The accuracy of classifications results, before and after post processing, were evaluated using confusion matrix method. The result showed that Maximum Likelihood Enhanced Neighbor classifier with post processing can produce land cover classification result of AVNIR data with good accuracy (total accuracy 94% and kappa statistic 0.92). ALOS AVNIR has been proven as a potential satellite data to map land cover in the study area with good accuracy.

Keywords: *ALOS-AVNIR, Maximum likelihood enhanced neighbor classifier, Confusion matrix*

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ABSTRACT

COMPARISON OF THE VEGETATION INDICES TO DETECT THE TROPICAL RAIN FOREST CHANGES USING BREAKS FOR ADDITIVE SEASONAL AND TREND (BFAST) MODEL / Yahya Darmawan; Parwati Sofan
IJReses, 9 (1) : 21-34

Remotely sensed vegetation indices (VI) such as the Normalized Difference Vegetation Index (NDVI) are increasingly used as a proxy indicator of the state and condition of the land cover/vegetation, including forest. However, the Enhanced Vegetation Index (EVI) on the outcome of forest change detection has not been widely investigated. We compared the influence of using EVI and NDVI on the number and time of detected changes by applying Breaks for Additive Seasonal and Trend (BFAST), a change detection algorithm. We used MODIS 16-day NDVI and EVI composite images (April 2000-April 2012) of three pixels (pixels 352, 378, and 380) in the tropical peat swamp forest area around the flux tower of Palangka Raya, Central Kalimantan. The results of BFAST method were compared to the Normalized Difference Fraction Index (NDFI) maps and the maps were validated by the hotspot of the Infrastructure and Operational MODIS-Based Near Real-Time Fire (INDOFIRE). Overall, the number and time of changes detected in the three pixels differed with both time series data because of the data quality due to the cloud cover. Nonetheless, we found that EVI is more sensitive than NDVI for detecting abrupt changes such as the forest fires of August 2009-October 2009 that occurred in our study area and it was verified by the NDFI and the hotspot data. Our results demonstrated that the EVI for forest monitoring in the tropical peat swamp forest area which is covered by intense cloud cover is better than that NDVI. Nonetheless, further research with improving spatial resolution of satellite images for application of NDFI is highly recommended.

Keywords: NDVI, EVI, BFAST method, NDFI, Forest Changes, Indonesia

IDENTIFYING PATTERNS OF SATELLITE IMAGERY USING AN ARTIFICIAL NEURAL NETWORK / Iskhaq Iskandar; Azhar K. Affandi; Dedi Setiabudidaya; Muhammad Irfan;Wijaya Mardiansyah; Fadli Syamsuddin
IJReses, 9 (1) : 35 - 40

An artificial neural network analysis based on the self-organizing map (SOM) was used to examine patterns of satellite imagery. This study used 3 × 4 SOM array to extract patterns of satellite-observed chlorophyll-*a* (chl-a) along the southern coast of the Lesser Sunda Islands from 1998 to 2006. The analyses indicated two characteristic spatial patterns, namely the northwest and the southeast monsoon patterns. The northwest monsoon pattern was characterized by a low chl-a concentration. In contrast, the southeast monsoon pattern was indicated by a high chl-a distributed along the southern coast of the Lesser Sunda Islands. Furthermore, this study demonstrated that the seasonal variations of those two patterns were related to the variations of winds and sea surface temperature (SST). The winds were predominantly southeasterly (northwesterly) during southeast (northwest) monsoon, drived offshore (onshore) Ekman transport and produced upwelling (downwelling) along the southern coasts of the Lesser Sunda Islands. Consequently, upwelling reduced SST and helped replenish the surface water nutrients, thus supporting high chl-a concentration. Finally, this study demonstrated that the SOM method was very useful for the identifications of patterns in various satellite imageries.

Keywords: *Downwelling, Monsoon, Self-organizing map, Satellite imagery, Upwelling*

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ABSTRACT

ESTIMATION OF RADIOMETRIC PERFORMANCE OF ELECTRO-OPTICAL IMAGING SENSOR OF LOW EARTH EQUATORIAL ORBIT LAPAN SATELLITE / Ahmad Maryanto; Andy Indradjad; Dinari Nikken Sulastrie Sirin; Ayom Widipaminto
IJReses, 9 (1) : 41 - 52

Study of spectro-radiometric performance of electro-optical imager which is planned to be launched on low earth equatorial orbit LAPAN satellite was conducted through simulative calculation of image irradiance and its associated generated voltage at the image detector output. Simulative calculation was applied to three scenarios of selected spectral bands. Those spectral bands were selected spectra (1), which consisted of spectral bands B = (390-540 and 790-900) nm, G = (470-610 and 700-900) nm, and R = (590-650 and 650-900) nm; selected spectra (2) consisted of B1 = (390-540) nm, G1 = (470-610) nm, and R1 = (590-650) nm; and selected spectra (3) consisted of B1(Green) = (525-605) nm, B2(Red) = (630-690) nm, and B3(NIR) = (750-900) nm, on three scenarios of optical aperture or f-number (N) 2.8, 4.0, and 5.6. Green grasses, dry grasses, and conifers were examples of the imaged target, chosen as representation of vegetations. Kodak KLI-8023 was used as the optical detector. The integration time was assumed 3 miliseconds which correspond to about 20 m ground sampling distance (GSD). Solar zenith angle were varying from 90° (early morning) to 0° (solar noon). The results showed that option (3) of selected spectra, as proposed for pushbroom imager of LAPAN satellite, was relatively accepted to be implemented and complemented with f-number 4.0 of optical system used. Whereas simulation RGB color displayed composed by R = B2(Red), G = B3(NIR), B = B1(Green) also showed a greenish color sense as expected for vegetation imaged target.

Keywords: *image irradiance, solar zenith angle, imager LAPAN satellite*

RED TIDE DETECTION USING SeaWiFS STANDARD CHLOROPHYLL-a ALGORITHM IN SOUTHEAST KOREAN WATERS / Gathot Winarso
IJReses, 9 (1) : 53 –62

Cochlodinium polykrikoides red tides have occurred in summer every year at coastal waters of the South Korea. Chlorophyll-a concentration data estimated from ocean color satellite SeaWiFS (Sea-viewing Wide Field-of-view Sensor) were used to detect the red tide in this study. The high value of chlorophyll-a concentration used to detect red tide was analyzed and compared with red tide map produced by National Fisheries Research and Development Institute of Korea (NFRDI). Based on SeaWiFS data and NFRDI red tide map, it was found that high chlorophyll-a concentration of ≥ 5 mg/m^3 in SeaWiFS images corresponded to the red-tide occurrence with some limitations.

Keywords: *Cochlodinium polykrikoides, Chlorophyll-a, SeaWiFS, Red tide*

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ABSTRACT

ORTHORECTIFICATION OF SPOT-4 DATA USING RATIONAL POLYNOMIAL COEFFICIENTS/ Danang Surya Candra
IJReses, 9 (1) : 63 - 67

Orthorectification of satellite imagery can be done in two ways i.e., rigorous sensor model and the approximation model of the satellite's orbit. Dependence on physical parameters, to make rigorous sensor model is more complicated and difficult to apply. The approximation model can be either Rational Polynomial Coefficients (RPC) model or parallel projection system. RPC is a mathematical model which is not depends on the sensor. It is used to improve the positioning accuracy when the parameter of the physical sensor model is unknown. This study assessed orthorectification of SPOT-4 using the RPC model with 7 coefficients. Root Mean Square Error (RMSE) of GCPs obtained from the study was less than 1 pixel. RPC did not depend on physical and satellite orbit parameters. Thus the RPC was simpler and easier to apply.

Keywords: *Orthorectification, Rational polynomial coefficient, SPOT-4*

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ABSTRACT

THE USE OF MODIS DATA TO EXTRACT A DUST STORM PRODUCT / Faten G. Abed; Abed Alkareem Abed Ali; Eshtar H. Nasser
IJReses, 9 (2) : 70 - 77

Iraq in the summer is affected by low pressure centered in the area of Arabian Sea and the Indian Ocean, and the high pressure region in the plateau of Anatolia. This climate system causes that the Shamal wind blows from the plateau of Anatolia in the north and northwest with relatively cold temperature. From mid-June to mid-September, the wind is accompanied with intensive heating of the earth surface causing dust storms rising up to thousand meters in the atmosphere above Iraq region. In recent years, the frequency of dust storm events was increased in Iraq and its surrounding regions due to the long drought seasons. Unsupervised classification method was used to determine the intensity of the dust storm and to identify the area of dust cloud. In this study, we were able to map dust storm over Iraq region using MODIS Terra and Aqua satellite data within thermal bands (band 31 and 32), and visible band VIS (band 1). Other thermal band (band 21) was used to produce RGB composite image specifying the dust storm. A spectral subtraction between two bands was also used to produce another RGB composite image to obtain better detection for the dust storm over Iraq region.

Keywords: *Dust storms, identification, composite image, change detection, MODIS*

COMPARISON ANALYSIS OF INTERPOLATION TECHNIQUES FOR DEM GENERATION USING CARTOSAT-1 STEREO DATA / Andie Setiyoko; Anil Kumar
IJReses, 9 (2) : 78 -87

Digital Elevation Model (DEM) can be generated using several techniques such as photogrammetric technique, interferometry, Lidar, etc. In photogrammetric technique, a DEM generation using stereo images, accuracy of generated DEM is also dependent on interpolation techniques. The process of interpolation is conducted to generate DEM as a continuous data from the point map that contained height information as a discrete data. In this research, point map was extracted from Cartosat-1 stereo image and from geodetic single frequency GPS in differential mode. Different interpolation techniques were applied on these data sets with different combination within these data sets. In this study, analysis of DEM interpolation was conducted with deterministic interpolators such as inverse distance weighted (IDW), global polynomial, local polynomial, and radial basis functions (RBF); and probabilistic interpolators such as simple kriging, ordinary kriging, universal kriging, indicator kriging, probabilistic kriging, disjunctive kriging, and cokriging. The accuracy of generated DEMs through different interpolation techniques were evaluated with ground point data collected from geodetic single frequency GPS in differential mode. Based on the analysis, the range error of DEMs generated was between 1.29 m to 2.96 m. Interpolation method with the least error was ordinary kriging using point map data and GPS points, while the highest error was obtained from global polynomial method.

Keywords: *DEM Generation, interpolation, kriging, point height*

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ABSTRACT

THE EFFECT OF THE EXTENT OF CORAL REEF AREA ON UNIFORM BOTTOM REFLECTANCE DETERMINATION FOR WATER COLUMN CORRECTION USING LANDSAT ETM/Syarif Budhiman; Ety Parwati; Emiyati
IJReses, 9 (2) : 88 -99

In one pixel of 30 meter spatial resolution of Landsat ETM multispectral sensor might consist of mixed bottom substrate types. The influence of a mixture of bottom substrate on the Landsat data can be a source of errors and together with the extent of coral reef area might contribute to affect the determination of uniform bottom reflectance. This study aimed to assess the effect of the extent of coral reef area on uniform bottom reflectance determination for water column correction. Lyzenga method was used for water column correction. This study carried out in two case studies using two sites with different size of coral reef ecosystems area i.e., Tidung island, in the Province of Jakarta and Maratua island, in the Province of East Kalimantan. Tidung island was selected to represent small area of coral reef ecosystem, while Maratua island was selected to represent relatively larger area of coral reef ecosystem. The results showed that the extent of coral reef influenced the determination of training sample areas for uniform bottom reflectance using Landsat ETM. The combination of moderate spatial resolution and the small area of coral reef ecosystem lead to the difficulties for uniform bottom substrate type determination at different depths.

Keywords: *coral reef, Landsat ETM, water column correction*

NEW AUTOMATED CLOUD AND CLOUD-SHADOW DETECTION USING LANDSAT IMAGERY / Kustiyo; Dianovita; Hedi Ismaya; Mulia Inda Rahayu; and Erna Sri Adiningsih
IJReses, 9 (2) :100-111

Cloud cover has become a major problem in the use of optical satellite imageries, particularly in Indonesian region located along equator or tropical region with high cloud cover almost all year round. In this study, a new method for cloud and cloud shadow detection using Landsat imagery for specific Indonesian region was developed to provide a more efficient and effective way to detect clouds and cloud shadows. Landsat Top of Atmosphere (TOA) reflectance and Brightness Temperature (BT) were used as inputs into the model. The first step was to detect cloud based on cloud physical properties using albedo and thermal bands, the second step was to detect cloud shadows using the Near Infrared (NIR), and Short Wave Infrared (SWIR) bands, and finally, the geometric relationships were used to match the cloud and cloud shadow layer, before proceeding to the production of the final cloud and cloud shadow mask. The results were then compared with other method such as tree base cloud separation. It showed that method we proposed could provide better result than tree base method, the accuracy result of this method was 98.75%.

Keywords: *Landsat, Cloud pixel, Potential cloud pixel, Cloud shadow*

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ABSTRACT

SEMI-AUTOMATIC SHIP DETECTION USING PI-SAR-L2 DATA BASED ON RAPID FEATURE DETECTION APPROACH / Katmoko Ari Sambodo
IJReses, 9 (2) :112 -119

Synthetic Aperture Radar (SAR) satellite an active sensor offering unique high spatial resolution regardless of weather conditions can operate both day and night time with wide area coverage. Therefore, SAR satellite can be used for monitoring ship on sea surface. This study showed on an alternative method for ship detection of SAR data using Pi-SAR-L2 (L-band, JAXA-Airborne SAR) data. The ship detection method is this study was consisted of eight main stages. After the Pi-SAR data was registered and speckle was filtered, then the land was masked using SRTM-DEM (Shuttle Radar Topography Mission-Digital Elevation Model) data since most ship detectors produced false detections when it applied to land areas. A ship sample image was then selected (cropped). The next step was to detect some unique keypoints of ship sample image using Speeded Up Robust Features (SURF) detector. The maximum distance ('MaxDist') of keypoints was also calculated. The same detector was then applied to whole Pi-SAR imagery to detect all possible keypoints. Then, for each detected keypoint, we calculated distance to other keypoint ('Dist'). If 'Dist' was smaller than 'MaxDist', then we marked these two (or more) keypoints as neighboring keypoints. If the number of neighbor keypoints was equal or greater than two, finally we marked these keypoints as 'Detected Ship' (draw rectangle and show its geographic position). Results showed that our method can detect successfully 32 'possible ships' from Pi-SAR-L2 data acquired on the area of North Sulawesi, Indonesia (August 8, 2012).

Keywords: *Ship detection, synthetic aperture radar, Pi-SAR-L2, keypoint, SURF detector*

SITE SELECTION OF SEAWEED CULTURE USING SPOT AND LANDSAT SATELLITE DATA IN PARI ISLAND / Bidawi Hasyim; Wawan K. Harsanugraha; Yennie Marini; Anneke K.S. Manoppo
IJReses, 9 (2) :120 - 127

One of several factors for seaweed culture success is to determine the suitable location for seaweed culture based on oceanographic parameters. The best location for seaweed culture is coastal waters with suitable requirements for total suspended solid (TSS), sea surface temperature (SST), and area with calm water that is sheltered from waves, strong current and predator, such as lagoon in the middle of an atoll. The purpose of this study was to locate the suitable area for seaweed culture in Pari island, Seribu island using SPOT and LANDSAT-TM data. The results showed that TSS in Pari island waters were in the range of 150 mg/l - 200 mg/l, SST in the range of 22-29°C, while coral reefs and lagoon was only available in some coastal locations. The analysis showed that most of Pari island waters were suitable for seaweed culture.

Keywords: *satellite data, seaweed culture , site selection, coastal waters*

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ABSTRACT

COASTAL UPWELLING UNDER THE INFLUENCE OF WESTERLY WIND BURST IN THE NORTH OF PAPUA CONTINENT, WESTERN PACIFIC / Harold J.D.Waas; Vincentius P. Siregar; Indra Jaya; and Jonson Lumban Gaol
IJReses, 9 (2) :128 - 139

Coastal upwelling play an important role in biological productivity and the carbon cycle in the ocean. This research aimed to examine the phenomenon of coastal upwelling that occur in the coastal waters north of Papua continent under the influence of Westerly Wind Burst(WWB) prior to the development of El Nino in the Pacific. Data consisted of sea surface temperature, vertical oceanic temperature, ocean color satellite image, wind stress and vector wind speed image, sea surface high, and Nino 3.4 index. Coastal upwelling events in the northern coastal waters of Papua continent occurred in response to westerly winds and westerly wind burst (WWBs) during December to March characterizing by low sea surface temperature (SST) (25 - 28°C), negative sea surface high deviation and phytoplankton blooming, except during pre-development of the El Nino 2006/2007 where weak upwelling followed by positive sea surface high deviation. Strong coastal upwelling occurred during two WWBs in December and March1996/1997 with maximum wind speed in March produced a strong El Nino 1997/1998. Upwelling generally occurred along coastal waters of Jayapura to Papua New Guinea with more intensive in coastal waters north of Papua New Guinea indicated by Ekman transport and Ekman layer depth maximum.

Keywords: *Coastal upwelling, wind burst, El Nino, Ekman transport, Ekman layer Depth.*

DROUGHT AND FINE FUEL MOISTURE CODE EVALUATION: AN EARLY WARNING SYSTEM FOR FOREST/LAND FIRE USING REMOTE SENSING APPROACH /Yenni Vetrita; Indah Prasasti; Nanik Suryo. Haryani; M. Priyatna;M. Rokhis Khomarudin
IJReses, 9 (2) :140 -147

This study evaluated two parameters of fire danger rating system (FDRS) using remote sensing data i.e. drought code (DC) and fine fuel moisture code (FFMC) as an early warning program for forest/land fire in Indonesia. Using the reference DC and FFMC from observation data, we calculated the accuracy, bias, and error. The results showed that FFMC from satellite data had a fairly good correlation with FFMC observations (r=0.68, bias=7.6, and RMSE=15.7), while DC from satellite data had a better correlation with FFMC observations (r=0.88, bias=49.91, and RMSE=80.22). Both FFMC and DC from satellite and observation were comparable. Nevertheless, FFMC and DC satellite data showed an overestimation values than that observation data, particularly during dry season. This study also indicated that DC and FFMC could describe fire occurrence within a period of 3 months before fire occur, particularly for DC. These results demonstrated that remote sensing data can be used for monitoring and early warning fire in Indonesia.

Keywords: *Fire danger rating systes, Drought code, Fine fuel moisture code*